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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 8, NUMBER 23
DECEMBER 1, 1975

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CODEN: SWRABW

OFFICE OF WATER RESEARCH AND TECHNOLOGY
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 8, NUMBER 23
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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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04 WATER QUANTITY MANAGEMENT AND CONTROL
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06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

THE CRYSTAL AND MOLECULAR STRUCTURE OF SELECTED PESTICIDAL WATER POLLUTANTS,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-11351

2. WATER CYCLE

2A. General

COMPARATIVE ANALYSIS OF ESTIMATION METHODS IN NONLINEAR FUNCTIONAL MODELS OF THE RAINFALL-RUNOFF PROCESS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
A. R. Rao, and R. G. S. Rao.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 887, $5.25 in paper copy, $2.25 in microfiche. Technical Report No 56, December 1974. 107 p, 17 fig, 13 tab, 36 ref, append. OWRT B-025-IND(5).

Descriptors: *Rainfall-runoff relationships, *Mathematical models, *Urban runoff, Drainage, Unit hydrographs, Hydrograph analysis, Model studies, *Indiana, Simulation analysis, Estimating.
Identifiers: *Nonlinear models, *Kernel functions.

The methods of estimation of kernel functions of nonlinear functional models proposed by Brandstetter and Amorocho, Boneh and Diskin, Bidwell, and Roy and Sherman are compared. The rainfall-runoff data from an urban (Ross Ade) watershed in West Lafayette, Indiana were used in the study. The computational complexity, the performance of the estimated kernels in both the regeneration and prediction modes were used for comparing the different methods of estimation of kernal functions. The analysis was conducted to select a method which can be easily used and which is also accurate. The method of kernel function estimation by Brandstetter and Amorocho was selected as the most desirable method on the basis of computational ease, flexibility and accuracy. The second objective was to demonstrate the utility of the functional series models in simulating the short time increment runoff process. The nonlinear functional models can be used for simulation of runoff provided the kernel functions of these models are accurately estimated.
W75-11354

THE SPACE/TIME COEEFFICIENT METHOD FOR CALCULATION OF RAINWATER RUNOFF (DAS RAUMZEITBEIWERTVERFAHREN FUER DIE BERECHNUNG VON REGENWASSERABFLUESSEN),
For primary bibliographic entry see Field 5D.
W75-11384

DEMODULATION OF STREAM-FLOW SERIES,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W75-11449

SEDIMENT TRANSPORT THEORIES: A REVIEW,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 2J.
W75-11453

STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF PUERTO RICO,
National Weather Service, Silver Spring, Md. Office of Hydrology.
F. P. Ho.
Available from National Technical Information Service, U.S. Department of Commerce, Sills Building, 5285 Port Royal Road, Springfield, Va 22161. NOAA Technical Memorandum NWS HYDRO-23, May 1975. 43 p.

Descriptors: *Wind tides, *Storm surge, *Computer models, *Coasts, Tides, Storms, Hurricanes, Hydrodynamics, Winds, Oceanography, Climatology.
Identifiers: *Puerto Rico coast, Storm height frequency distributions, National Flood Insurance Program, Tide levels, Coastal floods.

Storm tide height frequency distributions on the coast of Puerto Rico are developed for the National Flood Insurance Program by computing storm tides from a full set of climatologically representative hurricanes, using the National Weather Service hydrodynamic storm surge model adapted to local conditions. Hurricane parameters are analyzed and presented. Tide levels for the southern coast of Puerto Rico are shown in coastal profile between annual frequencies of 0.10 and .002. Similar tide levels for San Juan on the northern coast and Mayaguez on the western coast are also presented, and tentative interpolated tide levels of .01 annual frequency for the remaining coasts. Wave effects on the north coast are discussed. (NOAA)
W75-11561

IMPROVEMENT OF COMBINED SEWER SYSTEM STORM WATER STORAGE POOL (GORYU-SHIKI GESUIDO NO KAIRYO, TAISUI IKE HOSHIKI),
For primary bibliographic entry see Field 5D.
W75-11621

EVAPORATION DATA IN TEXAS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 7C.
W75-11630

SOIL MOISTURE ACCOUNTING COMPONENT OF THE USDAHL-74 MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2G.
W75-11656

METEOROLOGICAL, TOPOGRAPHICAL, AND CONSTRUCTION INFLUENCE ON THE RAIN RUNOFF IN SEWER SYSTEMS (METEOROLOGISCHE, TOPOGRAPHISCHE UND BAUTECHNISCHE EINFLUESSE AUF DEN REGENABFLUSS IN KANAL-ISATION-SNETZEN),
For primary bibliographic entry see Field 5D.
W75-11712

THE VALUE OF THE PEAK RUNOFF COEFFICIENT PSIS (UEBER DEN AUSSAGEWERT DES SPITZENABFLUSSBEIWERTES PSIS),
J. Keser.
Gas-und Wasserfach-Wasser/Abwasser, Vol 116, No 1, p 17-19, 1975. 4 fig, 6 ref.

Descriptors: *Rainfall-runoff relationships, *Rainfall intensity, Topography, Runoff coefficient, Precipitation(Atmospheric), Mathematical studies, Model studies.

The value and relevance of using the peak runoff coefficient, a ratio of the peak runoff yield to the peak rain yield, is discussed. The peak runoff coefficient indicates that a certain duration of the peak rainfall yield is necessary to generate an increase in the runoff. The peak runoff coefficient is predominantly influenced by precipitation and topographical characteristics; these describes the distribution of the runoff over time. The dependence of the peak runoff coefficient on the rainfall characteristics is influenced by the terrain but it is not conditioned by the precipitation. The peak runoff coefficient is determined from the transfer function that is characteristic for the terrain, and is constant even for prolonged rainfall events. The total runoff coefficient must be consistently greater than the peak runoff coefficient. (Takacs-FIRL)
W75-11713

MAN ON THE HYDROLOGIC CYCLE,
Annamalai Univ., Annamalainagar (India).
K. Achuthan.
Water Resources Bulletin, American Water Resources Association, Vol 10, No 4, p 756-758, August 1974. 2 ref.

Descriptors: *Hydrologic cycle, Precipitation, Evaporation, Storage, Conservation, Water utilization, Water balance, Environment.

Man is the one biological factor that can either make environment fit his needs or unknowingly ruin it. The major phases of the hydrologic cycle in which man interfere are: precipitation, storage, and evaporation. A change in any one phase will generally cause modification to the other phases of the cycle: the only certainty is that the water balance will indeed balance. Through conservation practices and careful management and through critical study of cause and effect, the hydrologist can be influential in raising living standards and making his country self-supporting and prosperous. (Bell-Cornell)
W75-11776

MODELS OF THE STOCHASTIC AND CHRONOLOGIC STRUCTURE, PREDICTION AND SIMULATION OF RUNOFF SEQUENCES - APPLICATION TO THE LOWER OHIO BASIN,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11783

PROCEEDINGS OF THE WATER HARVESTING SYMPOSIUM, PHOENIX, ARIZONA, MARCH 26-28, 1974.
Western Regional Research Lab., Berkley, Calif.
For primary bibliographic entry see Field 3B.
W75-11800

HYDROLOGIC ASPECTS OF WATER HARVESTING IN THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Boise, Idano. Northwest Watershed Research Center.
C. L. Hanson, E. L. Neff, and D. A. Woolhiser.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 129-140, 9 fig, 3 tab, 7 ref.

Descriptors: *Water harvesting, *Water supply, *Watersheds(Basins), *Water storage, *Rainfall-runoff relationships, *Simulation analysis, Semiarid climates, Stock water, Streaflow, Water tanks, Flow Drainage systems, South Dakota, Runoff, Rainfall, Seepage, Reservoirs, Ponds, Simulated rainfall, Systems analysis, Computer models, Mathematical models, Markov processes, Stochastic processes, *Great Plains.
Identifiers: Northern great plains, Runoff farming.

The systems approach for simulating storage of water in ponds is based on hydrologic information, contributing area, number of cattle, length of grazing season, seepage estimates, and evaporation rates, and has three essential steps: system description, selection of an objective function, and optimization. Daily rainfall can be simulated, using a stochastic model. Pond simulation using an example watershed was done to test this model. The Markov chain-exponential model described daily precipitation, and either of the two stochastic models, exponential or beta, described the relationship between daily precipitation and runoff. Seepage loss was the most difficult to describe. (See also W75-11800) (Robinett-Arizona)
W75-11811

2B. Precipitation

THE RAINFALL RECORDER PROBLEM,
Birmingham Univ. (England). Dept. of Civil Engineering.
P. S. Kelway.
Journal of Hydrology, Vol 26, No 1/2, p 55-77, July 1975. 3 fig, 6 tab, 20 ref.

Descriptors: *Rainfall, *Radar, *Precipitation gages, *Rain gages, Networks, Computer programs, Sampling, Instrumentation, Time, Charts, Quality control, Data collections.
Identifiers: *Rain recorders, Errors, *Error detection, *England, *Wales, Fault reduction.

Comparison of areal rainfall estimates derived from Radar measurements and ground-based recording rain gages was initiated at the University of Birmingham. To obtain data for various storms to be analyzed during the project, it was necessary to set up a system to collate and process information from rainfall recorders over England and Wales. Three major groups of difficulties were apparent: (1) collation of available data; (2) the wide variety of recorder types and numerous sources of error associated with them, and (3) the difficulty of abstracting data from the recording media. It was not easy to obtain recording gage data due to the number of different authorities that had to be approached. A computer-based schedule, with annotated details with any gage or site shortcomings, was compiled of all recording gages using the Meteorological Office information as a basis. The most common gages found were the weighing gage, the tilting-syphon gage, natural-syphon gage, hyeotgraph, and rate-of-rainfall recorder. Most instrumental errors were found to occur through a lack of effective maintenance. Trouble occurred from the ingress of foreign matter into joints which should be sealed. Most pen faults could have been prevented by use of glass recording pens and plasticized charts or pressure-sensitive chart recorders. The project showed the need for a central collection agency and a comprehensive system of data processing. (Roberts-ISWS)
W75-11448

COMPARISON OF PRECIPITATION GAGE CATCHES WITH A MODIFIED ALTER AND A RIGID ALTER TYPE WINDSHIELD,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
W. J. Rawls, D. C. Robertson, J. F. Zuzel, and W. R. Hamon.
Water Resources Research, Vol 11, No 3, p 415-417, June 1975. 1 fig, 2 tab, 6 ref.

Descriptors: *Precipitation gages, *Storms, *Idaho, Wind velocity, Eddies, Rain, Linear programming, Temperature, Regression analysis, Snowfall, Rain gages, Climatology, Climatic data.
Identifiers: *Alter windshield, *Gage catch, Hamon dual gage.

Precipitation gage catch from two Belfort Model 5-780 standard weighing recording rain gages, one with a modified Alter Windshield and one with a rigid Alter type windshield, were compared for 89 storms with wind speeds ranging from 4 to 32 mph and temperatures ranging from 14 to 69 degrees F. The differences between gage catches were statistically significant at the 1% level for wind speeds of 12 to 16 mph and for temperatures of 23 degrees F. Since on the average the windshields do not produce significantly different catches, either windshields can be used to compute actual precipitation by using the Hamon dual gage approach. (Roberts-ISWS)
W75-11457

ATMOSPHERIC PHYSICS AND CHEMISTRY LABORATORY: COLLECTED REPRINTS 1973.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. November 1974. 174 p.

Descriptors: *Atmospheric physics, *Chemical analysis, Meteorology, Precipitation(Atmospheric), Atmosphere, Radiation, Physical properties, Crystals, Cloud seeding, Climatology.
Identifiers: *Atmospheric composition, Transport mechanisms, Snow crystals, Ice nuclei, Atmospheric aerosols.

This report is a collection of 33 reprints for 1973 on the subject of atmospheric physics and chemistry. Included in this volume are articles on atmospheric composition, transport mechanisms, precipitation, aerosols, radiation, ozone, radiometry, seeding, and snow crystal formation. (NOAA)
W75-11552

A FEDERAL PLAN FOR NATURAL DISASTER WARNING AND PREPAREDNESS, FIRST SUPPLEMENT FY 1976 - 1980.
National Oceanic and Atmospheric Administration, Washington, D.C.
Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, for $1.75. June 1975. 101 p.

Descriptors: *Warning systems, *Storms, *Disasters, *Climatic data, *Weather forecasting, *Weather modification, Damages, Safety, Earthquakes, Floods, Tornadoes, Volcanoes, Landslides, Avalanches, Hurricanes, Droughts, Ice, Meteorology, Snow, Weather, Tsunamis, Forecasting.
Identifiers: *Natural disasters warning, Federal plans, Natural hazards, Storm warnings.

The Federal Plan for Natural Disaster Warning and Preparedness, June 1973, presented the Federal action programs and plans for fiscal years 1973 - 78 to satisfy the unmet needs in the existing natural disaster warning system and community preparedness programs. This first supplement to the Plan examines the recent performance of the disaster warning system, reports the progress made toward improving the warning system and community preparedness program, and updates the action plans of the ten participating Federal agencies for fiscal years 1975 - 80 to satisfy identified needs. (NOAA)
W75-11553

SOME CLIMATOLOGICAL CHARACTERISTICS OF HURRICANES AND TROPICAL STORMS, GULF AND EAST COASTS OF THE UNITED STATES,
National Weather Service, Silver Spring, Md.
F. P. Ho, R. W. Schwerdt, and H. V. Goodyear.
Available from National Technical Information Service, U.S. Department of Commerce, Sills Building, 5285 Port Royal Road, Springfield, Va 22161. NOAA Technical Report NWS 15, May 1975. 87 p, 33 fig, 5 tab, 27 ref, append.

Descriptors: *Hurricanes, *Tropical cyclones, *Storms, *Climatology, Storm surge, Winds, Meteorology, Charts, Weather data, Data collections, Probability, Climatological data.
Identifiers: *Hurricane factors, *Climatological characteristics, Landfalling hurricanes, Gulf coast(US), East coast(US), Smoothed frequencies.

A climatology of hurricane factors important to storm surges is presented for the U.S. gulf and east coasts. A smoothed frequency of tropical storms and hurricanes entering and exiting the coast and storms passing within 150 nautical miles of the coast during the period 1871-1973 is given. The central pressure for hurricanes and tropical storms and the radius of maximum winds and speed of forward motion for hurricanes were obtained from data analysis. Directions of landfalling hurricanes and tropical storms at the time they crossed the coast at selected points were also analyzed. The probability distribution of each factor is plotted and analyzed for each 50-n.mi. interval along the coast. Selected probability levels of each distribution are then summarized, and smoothed variations along the coast are obtained by analysis. The speeds of motion for two classes of hurricanes (those that entered the coast and those that passed within 150 n.mi. of the coast) are studied separately and a smooth speed analysis is determined for each. The question of joint probability among the various factors and with latitude is discussed qualitatively. (NOAA)
W75-11556

FURTHER STUDIES ON THE ORIGIN OF HURRICANES,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
H. Riehl.
Atmospheric Science Paper No. 235, February 1975. 23 p, 25 fig, 11 ref. Grant No. N22-31-72(G).

Descriptors: *Hurricanes, *Tropical cyclones, *Storms, Meteorology, Weather patterns, Weather, Weather data, Climatology, Turbulence, Heat.
Identifiers: *West Indies, *Hurricane origin, Hurricane formation, Tropical storms, Storm formations.

While there is no question that release of latent heat of condensation is a major factor in driving mature hurricanes, uncertainty has remained about its role in hurricane formation and the cause of large intensity increases sometimes experienced by a hurricane which had persisted on some plateau for several days. It has previously been hypothesized by the author that hurricane initial intensification is often related to a one to two day prior increase of upper tropospheric baroclinicity 500-1000 km around the pre-cyclone disturbance. This prior increase of upper level baroclinicity is usually associated with a traveling middle-latitude westerly cyclone. A number of recent year examples in the West Indies are presented. (NOAA)
W75-11559

STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF NORTH CAROLINA, SOUTH OF CAPE LOOKOUT,
National Weather Service, Silver Spring, Md. Office of Hydrology.
F. P. Ho, and R. J. Tracey.
Available from the National Technical Information Service, U.S. Department of Commerce, Sills Building, 5285 Port Royal Road, Springfield, Va 22161. NOAA Technical Memorandum NWS HYDRO-21, May 1975. 44 p, 12 fig, 7 tab, 28 ref.

Descriptors: *Wind tides, *Storm surge, *Computer models, *Coasts, Tides, Storms, Hurricanes, Hydrodynamics, Winds, Oceanography, Climatology.
Identifiers: *North Carolina coast, Storm tide height frequency distributions, National Flood In-

surance Program, Cape Lookout(NC), Tide levels, Coastal floods.

Storm tide height frequency distributions are developed on the coast of North Carolina, south of Cape Lookout, for the National Flood Insurance Program by computing storm tides from a full set of climatologically representative hurricanes, using the National Weather Service hydrodynamic storm surge model. Tide levels are shown in coastal profile between annual frequencies of 0.10 and .002. This report is intended for use in estimating actuarial risk to buildings from coastal floods and in land use management. (NOAA)
W75-11560

A SATELLITE CLASSIFICATION TECHNIQUE FOR SUBTROPICAL CYCLONES,
National Weather Service, Fort Worth, Tex. Southern Region.
P. H. Hebert, and K. O. Poteat.
NOAA Technical Memorandum NWS SR-83, July 1975. 6 fig, 7 tab, 8 ref.

Descriptors: *Tropical cyclones, *Cyclones, *Satellites(Artificial), *Weather forecasting, Weather, Weather patterns, Subtropic, Storms, Hurricanes, Meteorology, Meteorological data, Winds, *Remote sensing.
Identifiers: Satellite pictures, *Subtropical cyclones, *Cyclone types, Weather satellites, Cyclone intensity, Dvorak technique.

The Dvorak (1973) technique for estimating the intensity of tropical (T) cyclones from satellite pictures is frequently inapplicable for subtropical (ST) cyclones. A new technique which gives not only the intensity but also the type (tropical, subtropical) of cyclone has been derived, using guidelines similar to the Dvorak scheme, so that the two systems will intermesh when cyclones change type. These guidelines were evaluated by Miami Satellite Field Services Station (SFSS) meteorologists for a data sample of 32 cases (27 subtropical) for the period May-November 1968-74. Results indicate mean absolute wind errors comparable to those using the Dvorak technique, as well as a successful meshing of the two techniques, and the ability to distinguish between the two types of cyclones. (NOAA)
W75-11562

SOURCES OF WATER QUALITY, LAKE LEVEL, ICE, WATER TEMPERATURE AND METEOROLOGICAL DATA FOR THE ST. LAWRENCE GREAT LAKES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W75-11567

HURRICANE EXPERIENCE LEVELS OF COASTAL COUNTY POPULATIONS - TEXAS TO MAINE,
National Weather Service, Fort Worth, Tex.
P. J. Hebert, and G. Taylor.
July 1975. 161 p.

Descriptors: *Hurricanes, *Storms, *Tropical cyclones, Climatology, Meteorology, Coasts, Atlantic Coastal Plain, Gulf Coastal Plain, Weather, Damages, Disasters, Floods, Rain, Winds, Human population.
Identifiers: *Coastal hurricanes, *Coastal storms, *Hurricane levels, *Hurricane scales, *Severe storms, Coastal populations, Atlantic coast, Gulf Coast storms, Atlantic Coast storms, Saffir/Simpson hurricane scale.

Population graphs for the period 1900-1970 have been prepared for coastal counties from Texas to Maine which could be affected significantly by hurricane winds and/or tides. The Saffir/Simpson Hurricane Scale (range 1-5) has been used to develop a hurricane climatology for each county for the period 1900-1974. The combined statistics graphically illustrate that over 75 percent of all Atlantic and Gulf coastal residents of the United States have never experienced the effects of a direct hit by a major jurricane. (NOAA)
W75-11570

TROPICAL CYCLONE INTENSITY ANALYSIS AND FORECASTING FROM SATELLITE IMAGERY,
National Environmental Satellite Service, Washington, D.C.
V. F. Dvorak.
Mariners Weather Log, Vol 19, No 4, p 199-206, July 1975. 5 fig, 5 ref.

Descriptors: *Tropical cyclones, *Weather forecasting, *Satellites(Artificial), *Remote sensing, Analysis, Climatological data, Meteorology, Climatology.
Identifiers: *Tropical cyclone intensity, *Satellite imagery, Cloud characteristics, Modeled curve, Intensity forecast, Intensification process.

This report describes a systematic procedure for estimating tropical cyclone intensities using imagery from meteorological satellites. Two sets of cloud characteristics are analyzed, with guidance from a model of tropical cyclone change derived empirically from satellite data. One set of characteristics is used to estimate cyclone intensity. It is made up of three parameters: the central features which define the cloud system center and its relation to dense-overcast clouds; the outer banding features which curve around the central features; and the vertical depth of the clouds comprising these features. Intensity is considered to be related to the sum of the three parameters. The assessment of intensity is made in three stages. The first yields a modeled estimate of the cyclone's intensity; the second and third use the cloud pattern and feature measurements to verify or adjust the modeled expectation. The second set of cloud features is then analyzed to determine if an extrapolation along the cyclone's particular modeled curve is to be used for the 24-hour intensity forecast. These features are related to the intensification process within the cyclone and to environmental changes that may affect the cyclone during the forecast period. (NOAA)
W75-11577

WESTERN NORTH PACIFIC TYPHOONS, 1974,
Fleet Weather Central FPO San Francisco, 96630.
C. R. Holliday.
Mariners Weather Log, Vol 19, No 4, p 207-224, July 1975. 25 fig, 4 tab.

Descriptors: *Typhoons, *Climatological data, *Synoptic analysis, Tropical cyclones, Climatology, Meteorology, Storms, Monsoons, Documentation, Weather data, *Pacific Ocean.
Identifiers: West north Pacific, *Tropical cyclone activity, Supertyphoons, Typhoon days, Philippine Islands, Monsoon westerlies.

There was a sharp reversal, during 1974, from the abnormally light tropical cyclone activity observed during 1973. Named tropical cyclones numbered 32, 10 percent higher than the latest 15-year average. The number of typhoon days, however, numbered only 62, well below the 15-year average of 90 days, reflecting a tendency of this season's tropical cyclones not to develop beyond storm strength. No supertyphoons were observed during 1974, the first such occurrence since documentation began in 1959. One of the unusual synoptic features during August and September was the penetration of monsoon westerlies to more poleward latitudes than normal. By early October, however, the monsoon through became reestablished near its normal position in the Philippine Sea, and triggered development of a series of destructive cyclones that crossed the Philippine Islands. The frequency of repeated onslaughts to the island of Luzon is unparalleled in climatological records available since World War II. (NOAA)
W75-11578

CENTRAL NORTH PACIFIC TROPICAL CYCLONES, 1974,
Fleet Weather Central FPO San Francisco, 96630.
C. R. Holliday.
Mariners Weather Log, Vol 19, No 4, p 224, July 1975. 1 fig.

Descriptors: *Tropical cyclones, *Climatological data, *Hurricanes, Synoptic analysis, Climatology, Meteorology, Storms, Documentation, Weather data, *Pacific Ocean.
Identifiers: Central north Pacific, *Tropical cyclone activity, Tropical storm Olive, Hurricane Ione, Hawaiian Islands.

The 1974 hurricane season in the central Pacific followed a pattern similar to that of recent years -- short, but active. In general, there also was a similarity in life cycle and track with previous years' storms. (NOAA)
W75-11579

CELLULAR SNOW GENERATION--A DOPPLER RADAR STUDY,
Chicago Univ., Ill. Lab. for Atmospheric Probing.
R. E. Carbone, and A. R. Bohne.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1384-1394, July 1975. 5 fig, 1 tab, 16 ref, append. ONR N00014-67A-0285-0014, NSF GA-38109.

Descriptors: *Snow, *Radar, *Cloud physics, Convection, Measurement, Crystals, Snowfall, Precipitation(Atmospheric), Velocity, Air circulation, Meteorology.
Identifiers: *Doppler radar, Doppler velocity spectra, Reflectivity, Updrafts.

Snow generating cells were observed by vertically pointing Doppler radar. Analysis was carried out in three distinct regions. The region exhibiting cellular structure was found to consist of convective elements with vertical velocities + or -1.5 m/s in magnitude. A generation region was found to exist beneath the convective region with updrafts of 0.5 m/s sustained over a 7 km path length which originated at a generating level less than 75 m in depth associated with an inversion layer. The trail region below exhibited maximum downdrafts of 0.5 m/s or no net vertical motions. Maximum ice content was estimated to be no larger than 0.24 g/cu m in the convective cells. Growth appeared to take place throughout the rise and fall of the snow crystals in the updraft regions. (Sims-ISWS)
W75-11634

TROPICAL SHOWERS IN AN AXISYMMETRIC CLOUD MODEL,
Hawaii Univ., Hilo. Cloud Physics Observatory.
T. Takahashi.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1318-1330, July 1975. 20 fig, 34 ref. ONR 014-67A-0387-0015, NSF GA-40124.

Descriptors: *Model studies, *Cloud physics, *Rainfall, *Hawaii, Precipitation(Atmospheric), Rainfall intensity, Raindrops, Mathematical models, Computer models, Condensation, Evaporation, Rain, Clouds, Meteorology.
Identifiers: *Cloud models, Warm rains, Tropical showers, Cumulus clouds, Raindrop size.

Tropical showers from warm cumulus-type clouds were studied numerically in an axisymmetric cloud model. Drop sizes were classified into 61 groups and condensation (evaporation), collection, and breakup processes were introduced. The distinctive character of such showers--heavy, short-lived, and localized in nature, without any strong wind speed change near the ground--was simulated successfully. Because of the weak inflow, raindrop size distribution was primarily determined by the vertical trajectory of drops. The calculated

raindrop size distribution agreed relatively well with the Marshall-Palmer size distribution curve. A one-dimensional cylindrical cloud model was also compared with the present symmetric cloud model, and it was found that both rainfall and the life cycle for deep clouds were difficult to stimulate by a simple one-dimensional model. It was also found that the disturbance area due to the cumulus-type cloud is more localized than in the stratocumulus-type cloud. (Sims-ISWS)
W75-11635

AN ACCELERATION SYSTEM FOR WATER DROPS,
Toronto Univ. (Ontario). Dept. of Physics.
J. D. McTaggart-Cowan, and R. List.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1395-1400, July 1975. 6 fig, 12 ref.

Descriptors: *Laboratory equipment, *Cloud physics, *Drops(Fluids), Instrumentation, Equipment, Raindrops, Simulated rainfall, Meteorology, Laboratory tests.
Identifiers: *Raindrop simulation, Acceleration systems, Drop fall velocity.

Linear accelerator systems were described which allow the production of series of homogeneously sized water drops of different diameter and at terminal velocity, with small oscillations, negligible charges, and in air of low turbulence intensity. Combinations of parallel systems and blowers displacing the smaller drops into the path of the larger ones allowed the study of collision and breakup under conditions which essentially duplicate nature. the chances to observe interactions were considerably enhanced by opto-electronic selection devices. (Sims-ISWS)
W75-11636

COLLISION AND BREAKUP OF WATER DROPS AT TERMINAL VELOCITY,
Toronto Univ. (Ontario). Dept. of Physics.
J. D. McTaggart-Cowan, and R. List.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1401-1411, July 1975. 11 fig, 1 tab, 36 ref.

Descriptors: *Cloud physics, *Laboratory tests, *Raindrops, Drops(Fluids), Particle size, Rain, Coalescence, Precipitation(Atmospheric), Meteorology.
Identifiers: *Drop collisions, *Drop breakup.

The collision and subsequent breakup of water drops moving essentially vertically and at terminal velocity has been studied for 5 drop pairs. The diameters of the large drops were 4.8, 3.6, and 3.0 mm; the diameters of the small drops were 1.8 mm and 1.0 mm. 712 collisions were obtained in 25,000 individually recorded attempts. Three distinct types of collision-breakup were found with the following occurrence: necks 27%, sheets 55%, and disks 18%. Bag breakups were insignificant at less than 0.5%. All types are defined and corresponding examples shown. Fragment size and number distributions for the different types and the overall situation gave further reasons for the breakdown into the different types. The disk collision has been found to be the major cause for the depletion in number of large drops, hence the cutoff of large drops in rain. The results also form the first data bank for numerically modelling the evolution of raindrop size spectra and the Langmuir chain process. (Sims-ISWS)
W75-11637

COLLISION EFFICIENCY OF WATER DROPS IN THE ATMOSPHERE,
Missouri Univ., Rolla. Dept. of Mechanical and Aerospace Engineering.
C. L. Lin, and S. C. Lee.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1412-1418, July 1975. 8 fig, 26 ref, 1 append.
ONR N00014-69A-0141-0006.

Descriptors: *Coalescence, *Raindrops, *Cloud physics, Drops(Fluids), Mathematical models, Model studies, Meteorology, Precipitation(Atmospheric), Rainfall.
Identifiers: *Collision efficiency, Drop collisions.

A study has been made of the growth of water drops through collision in the atmosphere. The method of superposition of flow fields obtained from the numerical solution of the Navier-Stokes equations was used for the calculations, and only inertia, gravity, and drag force were considered. The calculated linear collision efficiency is significantly less than the geometric collision efficiency between a large collector drop and a small collecting drop because of the effect of hydrodynamic forces. The linear collision efficiency is substantially higher than the geometric collision efficiency between similarly sized drops because of the wake effect. To verify the validity of the calculations, the analytical results were compared with available experimental data. Satisfactory agreement was obtained for most drop sizes. It is concluded that in the absence of electricity and turbulence the dominant factor in the formation of precipitation is the collisional growth of similarly sized drops. (Sims-ISWS)
W75-11638

ON THE COLLECTION EFFICIENCY OF WATER DROPLETS UNDER THE INFLUENCE OF ELECTRIC FORCES, I: EXPERIMENTAL, CHARGE-MULTIPOLE EFFECTS,
Hebrew Univ., Jerusalem (Israel). Dept. of Atmospheric Sciences.
N. Dayan, and I. Gallily.
Journal of the Atmospheric Sciences, Vol 32, No 7, p 1419-1429, July 1975. 10 fig, 36 ref, 3 append.

Descriptors: *Cloud physics, *Drops(Fluids), *Electrical properties, Aerosols, Laboratory tests, Precipitation(Atmospheric), Meteorology.
Identifiers: *Collection efficiency, *Electric forces, Electric charge, Drop collisions, Drop growth.

The collection efficiency of water droplets under the influence of electric forces was studied in simulation experiments for the case of a charge-induced multipole interaction. With the aid of an elaborate laboratory apparatus, the size increase of a charged droplet falling through a cloud of neutral, almost uniform small particles was determined, and an average collection efficiency deduced. The experimental results indicated efficiencies of one or two orders of magnitude greater than the values for neutral droplets under otherwise similar conditions. The efficiences were also found to increase with the ratio of collected to collecting droplet sizes and were insensitive to variations of the electric charge of the particles. (Sims-ISWS)
W75-11639

ESTABLISHING WINDBREAKS IN SEMIARID AREAS BY ALTERING THE MICROCLIMATE OR SUPPLYING ADDITIONAL WATER,
Agricultural Research Service, Manhattan, Kans.
For primary bibliographic entry see Field 3B.
W75-11827

2C. Snow, Ice, and Frost

SEDIMENT RELATIONS OF SELECTED ALASKAN GLACIER-FED STREAMS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W75-11477

ATMOSPHERIC PHYSICS AND CHEMISTRY LABORATORY: COLLECTED REPRINTS 1973.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2B.
W75-11552

GREAT LAKES ICE COVER, WINTER 1973-74,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
R. A. Assel.
Available from Superintendent of Documents, US Government Printing Office, Washington, DC 20402, as C55.13:ERL 325-GLERL 1. NOAA Technical Report ERL 325-GLERL 1, July 1974, 60 p.

Descriptors: *Iced lakes, *Charts, *Ice cover, *Great Lakes, Hydrologic data, Documentation, Data collections, Meteorology, Lakes.
Identifiers: *Ice charts, *Ice floes, Satellite imagery, Seasonal trends, Aerial ice reconnaissance, Degree days.

Twenty composite ice charts were produced from ice-cover data received at the Lake Survey Center during the past winter. These charts illustrate estimated ice concentrations and distributions of the Great Lakes at weekly intervals from mid-December 1973 to the end of April 1974. In addition, 13 ice charts compiled from data collected by Lake Survey Center ice observers portray synoptic ice conditions on individual lakes and rivers. Freezing degree-day accumulations indicate the 1973-74 winter was near normal over the Great Lakes. Extensive ice formation in protected shore areas and shallow parts of the Great Lakes was initiated by below normal temperatures the second half of December and first half of January. Ice covers reached their maximum extent in February. Mild temperatures in early March resulted in rapid loss of ice on southern portions of the Great Lakes so that, by mid-March, they were virtually ice free. Last reports of ice were made in late April. (NOAA)
W75-11572

2D. Evaporation and Transpiration

TRANSPIRATION OF SOME OREOXEROPHYTES OF THE CENTRAL CAUCASUS, (IN GEORGIAN),
E. S. Oniani.
Soobshch Akad Nauk Gruz SSR, Vol 75, No 1, p 173-176, 1974. Illus.

Descriptors: *Xerophytes, Stomata, *Transpiration, Humidity, Vegetation.
Identifiers: *USSR(Central Caucasus), *Oreoxerophytes.

Studies were carried out in the humid subalpine zone of the Qazbegi (Kazbek) and in the relatively dry mid-mountain zone of the Jeirakh gorge (Russian SFSR, USSR). The intensity of transpiration of the same plant species is much higher in the subalpine zone than in the mid-mountain zone. In contrast to high-mountain meadow plants, stomata take a fairly active part in the regulation of oreoxerophytes transpiration. Hydro-labile as well as hydro-stable groups of vegetation were identified in both biotopes.--Copyright 1975, Biological Abstracts, Inc.
W75-11442

GRAIN SORGHUM EVAPOTRANSPIRATION AND WATER USE EFFICIENCY UNDER TRICKLE IRRIGATION,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-11582

MODIFIED PENMAN EQUATION TO PROVIDE THE UPPER BOUNDARY CONDITION IN COMPUTING EVAPORATION FROM SOIL,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.

W. J. Staple.
Soil Science Society of America Proceedings, Vol 38, No 5, p 837-839, September-October 1974. 2 fig, 16 ref.

Descriptors: *Evaporation, Vapor pressure, Soil, *Soil water movement, Drying, Measurement.
Identifiers: Soil columns, *Penman's equation, Potential evaporation.

Penman's equation for potential evaporation was modified by including in it the relative vapor pressure h of partially dried surface soil. The modified equation was used to predict evaporative flux from drying soil as a boundary condition in the finite difference solution of the flow equation. The method gave satisfactory agreement in a 20-day test in which evaporation was measured from short columns of soil in a fallowed plot. (Skogerboe-Colorado State)
W75-11598

RELATION BETWEEN NITRATE ABSORPTION AND WATER TRANSPIRATION BY CORN,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W75-11602

EVAPORATION DATA IN TEXAS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 7C.
W75-11630

EVAPOTRANSPIRATION AND SOIL MOISTURE IN UPLAND GRASS CATCHMENTS IN THE EASTERN PENNINES,
Leeds Univ. (England). Dept. of Geography.
J. G. Lockwood, and K. Venkatasawmy.
Journal of Hydrology, Vol 26, No 112, p 79-94, July 1975. 5 fig, 4 tab, 7 ref.

Descriptors: *Evapotranspiration, *Soil moisture, Agriculture, *Mathematical models, Pasture management, Crops, Precipitation(Atmospheric), Runoff, Albedo, Regime, Infiltration rates, Watersheds(Basins).
Identifiers: *Upland grass catchments, *Pennines, Pasture catchments, Potential evapotranspiration, Penman's method, Soil moisture model, Hydrologic regime, Infiltration capacity.

Mathematical models were used to investigate the mean moisture states and the actual evapotranspiration from two small pasture catchments in the eastern Pennines. Both precipitation and runoff were measured and potential evapotranspiration calculated by Penman's method. The only unknowns were actual evapotranspiration and soil moisture, and these were estimated using a two-stage soil moisture model. It was found that the catchment covered by typical Pennine rough grazing had an available soil moisture content of about 50 mm and an albedo of 0.18, both lower than the values for improved pasture. The rough grazing became quickly saturated after rain and rapidly dry in summer. It was found on both rough grazing and improved pasture with light or moderate rainfall amounts that the amount of runoff was controlled by the soil-moisture state and not by the infiltration capacity of the soil. With heavy rainfalls considerable runoff occurred while the soil at depth remained moderately dry. (Roberts-ISWS)
W75-11648

EVAPORATION SUPPRESSION FOR CONSERVING WATER SUPPLIES,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W75-11816

EVAPOTRANSPIRATION BY SUBIRRIGATED ALFALFA AND PASTURE IN THE EAST CENTRAL GREAT PLAINS,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 3F.
W75-11841

2E. Streamflow and Runoff

DEMODULATION OF STREAM-FLOW SERIES,
Bristol Univ. (England). Dept. of Geography.
M. G. Anderson.
Journal of Hydrology, Vol 26, No 1/2, p 115-121, July 1975. 4 fig, 1 tab, 11 ref.

Descriptors: *Fourier analysis, *Frequency, *Time series analysis, *Streamflow, *Methodology, Analytical techniques, Stochastic processes, Mathematics, Rainfall, Precipitation(Atmospheric), Model studies, Discharge(Water).
Identifiers: *Demodulation techniques, *River Blythe(England), Deterministic component.

Demodulation techniques enable changes in the amplitude and phase for a given frequency to be determined. In fitting two component models to hydrologic variables when one component is deterministic (oscillatory) and the other is stochastic, there is a danger of incorrectly assigning the two components should the amplitude of a given frequency of the deterministic component change with time. Two filters of different length are used in demodulation techniques. These techniques have been demonstrated to be a powerful method for identifying changes in the amplitude of an oscillation of a given frequency within precipitation and discharge time-series. As an example, the construction of a dam was verified by analysis of the annual discharge for the river Blythe. (Singh-ISWS)
W75-11449

A THREE-DIMENSIONAL THEORY OF COASTAL CURRENTS AND UPWELLING OVER A CONTINENTAL SHELF,
University of East Anglia, Norwich (England). School of Mathematics and Physics.
R. B. Hill, and J. A. Johnson.
Tellus, Vol 27, No 3, p 249-258, 1975. 3 fig, 9 ref, 2 append.

Descriptors: *Ocean circulation, *Continental shelf, *Model studies, *Mathematical models, Circulation, Water circulation, Ocean currents, Coasts, Winds, Continental slope, Upwelling, Boundary layers, Surfaces, Oceanography.
Identifiers: *Ekman layers.

The steady circulation of a homogeneous ocean was investigated in the region where the bottom rises to meet the surface at the coast as over a continental shelf. In this region the bottom Ekman layer becomes important and carries the coastal upwelling from the shelf interior region to the surface Ekman layer. A strong longshore current is produced in the shelf boundary layer and, for certain distributions of wind stress, an offshore deep counter-current is formed. At a given latitude the longshore flow near the coast depends on the local wind, whereas the offshore counter-current and the net northwards transport in the shelf layer are a function of the latitudinal distribution of wind stress. (Sims-ISWS)
W75-11450

RESISTANCE TO FLOW IN ALLUVIAL CHANNELS,
East-Central State Soil and Water Resources (Nigeria).
C. G. Ilo.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY6, Proceedings Paper 11352, p 665-679, June 1975. 3 fig, 6 tab, 18 ref, 3 append.

Descriptors: *Alluvial channels, *Flow, *Resistance, *Laboratory tests, *Flumes, Hydraulic models, Hydraulics, Flow characteristics, Open channels, Channels, Streambeds, Beds, River beds, Friction, Shear, Roughness(Hydraulic), Darcy-Weisbach equation, Graded, Regime, Canals, Channel morphology, Canal design, Rivers, Discharge measurement.
Identifiers: *Bed forms, Kinematics.

A direct method of predicting flow resistance and uniform velocity in alluvial channels was developed. The method covered all known bed-form regimes and not only eliminated trial-and-error computations and use of rigid-boundary channel flow formulas but also avoided the difficulties associated with the use of the various existing alluvial channel flow computation techniques. The study showed that the Darcy-Weisbach friction factor can be expressed as a unique function of the ratio of the bed form and grain shear stress components for any anticipated discharge and flow geometry, the bed-form shear component being uniquely determinable from the flow and channel material characteristics. The results confirmed that the friction factors is non-constant but varies with the bed-form regime. The applicability of the method to laboratory flumes, field canals, and natural rivers was illustrated. (Jess-ISWS)
W75-11459

PREDICTION OF FLOOD VOLUME FROM SMALL HUMID REGION WATERSHEDS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Comprehensive Resources Programming.
For primary bibliographic entry see Field 4A.
W75-11462

BOUNDARY SHEAR IN CHANNEL WITH FLOOD PLAIN,
Halcron (William) and Patners, London (England).
For primary bibliographic entry see Field 8B.
W75-11463

RIVER REGIME WITH SPECIAL REFERENCE TO RIVER NILE,
Assiut Univ. (Egypt). Dept. of Hydraulics.
For primary bibliographic entry see Field 2J.
W75-11464

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 1. NORTH ATLANTIC SLOPE BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11479

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11480

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11481

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 6. MISSOURI RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.

W75-11482

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 7. LOWER MISSISSIPPI RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11483

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 8. WESTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11484

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11485

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 6. MISSOURI RIVER BASIN--VOLUME 3, MISSOURI RIVER BASIN FROM SIOUX CITY, IOWA, TO NEBRASKA CITY, NEBRASKA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11486

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 8. WESTERN GULF OF MEXICO BASINS--VOLUME 2. BASINS FROM LAVACA RIVER TO RIO GRANDE.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11487

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 9. COLORADO RIVER BASIN--VOLUME 3. LOWER COLORADO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11488

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 10. THE GREAT BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11489

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON--VOLUME 1. PACIFIC SLOPE BASINS IN WASHINGTON EXCEPT COLUMBIA RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11490

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 13. SNAKE RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11491

FLOODS IN THE WAIAHOLE-WAIKANE AREA, OAHU, HAWAII,
Geological Survey, Honolulu, Hawaii.
C. J. Ewart, and R. Lee.
Open-file report, 1973. 10 p, 7 fig, 1 plate, 8 ref.

Descriptors: *Floods, *Flood frequency, *Flood data, *Hawaii, Flood profiles, Flood peak, Flood plains, Flood protection, Hydrologic data, Flood forecasting, Hydrographs, Streamflow.
Identifiers: *Oahu(Hawaii), Waiahole-Waikane area(Oahu).

Hydrologic data show the extent and frequency of flooding in the Waiahole-Waikane area of windward Oahu, Hawaii. The data provide a technical basis for the formulation of flood-plain regulations, building and zoning ordinances, the design and location of flood-control projects, and modification or improvement of the existing drainage system. The three main streams in the study area are Waiahole, Waikane, and a smaller unnamed stream, which is located between these two. Waiahole and Waikane streams head near the crest of the Koolau Range and are perrennial; the unnamed stream heads about the 700-foot elevation and is intermittent. The stream gradients are steep in the upper reaches and fairly flat on the coastal flood plain. Inundation boundaries and water-surface profiles for the 50-year flood were estimated by backwater analyses and represent current channel conditions. (Woodard-USGS)
W75-11495

PROGRESS REPORT TO THE ARKANSAS STATE HIGHWAY COMMISSION FOR YEAR ENDING JUNE 30, 1975,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 8B.
W75-11501

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE GRAYS HARBOR DRAINAGES, WASHINGTON,
Geological Survey, Tacoma, Wash.
J. E. Cummans, and E. G. Nassar.
Open-file report, 1975. 27 p, 3 fig, 1 plate, 3 tab, 13 ref.

Descriptors: *Low-flow frequency, *Streamflow, *Hydrologic data, *Washington, Rainfall-runoff relationships, Hydrology, Hydrologic cycle, Analytical techniques, Regression analysis, Seasonal, Flow-rates.
Identifiers: *Grays Harbor drainages(Wash).

Streams in the Grays Harbor drainage area, Washington, are varied in their annual volumes of runoff, and in the amounts of flow available during the low-flow period of middle and late summer. Many small streams are dry in summer. Mean annual precipitation in the area ranges from about 40 inches near Chehalis and Centralia to 220 inches in the headwaters of the Satsop, Wynoochee, and Humptulips River basins. About 10 percent of the precipitation occurs during May to August. Yearly variations in 7-day low flows of the Chehalis River near Grand Mound ranged from about 91 cfs in 1967 to about 261 cfs in 1937. Low-flow-frequency curves plotted from streamflow records at 15 continuous-recording stations having 10 or more years of record were used to determine data for low-flow durations of 7, 30, 60, 90, and 183 days. Regression techniques were used to estimate low flows with frequencies up to 20 years for stations with less than 10 years of record and at miscellaneous sites. Low-flow frequency data are listed for 161 sites. The median of monthly mean flows (monthly mean flow at the 2-year recurrence interval) is presented for selected sites. Factors that influence low flows are described briefly. Truly natural flows--those unaffected by man's activities or diversions--exist in very few streams in the area. (Woodard-USGS)
W75-11502

GREAT LAKES WATER LEVELS, 1974, DAILY AND MONTHLY AVERAGE WATER SURFACE ELEVATIONS.
NOAA National Ocean Survey, Washington, D.C.
For primary bibliographic entry see Field 2H.
W75-11554

CURRENT MEASUREMENTS USING A TILTING SPAR,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 7B.
W75-11564

TRACING OCEAN CURRENTS,
Washington Univ., Seattle. Sea Grant Advisory Service.
A. Duxbury.
May 1975, 5 p.

Descriptors: *Currents(Water), *Current meters, *Instrumentation, *Water measurement, Gages, Equipment, Rates, Velocity, Density currents, Ocean currents, Drift bottles, Flow, Flow measurement, Movement, Water circulation, Waves(Water).
Identifiers: Drifters, Weighted drifters, Bottom currents, Geostrophic currents.

This brief article describes techniques and equipment used to determine the movement of water. Techniques touched upon include the use of drift bottles to determine overall surface current patterns including speed and direction; weighted drifters for use in measuring bottom currents; following drifters to establish path fixes; use of current metering devices; use of supplemental techniques such as the determination of geostrophic currents; and the use of ship observations and atlases which contain information on the monthly magnitude and direction of the surface current for a given area. (NOAA)
W75-11574

HYMO FLOOD ROUTING,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 4A.
W75-11647

APPLICATION OF A GENERALISATION OF WALD'S IDENTITY TO SOLVING CERTAIN MULTI-STREAM STORAGE PROBLEMS,
Monash Univ., Clayton (Australia). Dept. of Mathematics.
For primary bibliographic entry see Field 4A.
W75-11649

THE VALUE OF THE PEAK RUNOFF COEFFICIENT PSIS (UEBER DEN AUSSAGEWERT DES SPITZENABFLUSSBEIWERTES PSIS),
For primary bibliographic entry see Field 2A.
W75-11713

MODELS OF THE STOCHASTIC AND CHRONOLOGIC STRUCTURE, PREDICTION AND SIMULATION OF RUNOFF SEQUENCES - APPLICATION TO THE LOWER OHIO BASIN,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
P. C. Tao, and J. W. Delleur.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 256, $5.75 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center, Technical Report No. 60, 1975. 124 p, 24 fig, 17 tab, 40 ref, 4 append. OWRT-B-036-IND(9).

Descriptors: *Streamflow forecasting, *Stochastic processes, *Statistical models, *Rainfall-runoff processes, River forecasting, Time series analysis, Fourier analysis, Indiana, Ohio, Kentucky, *Ohio River.
Identifiers: *ARMA Processes, Multivariate analysis, Disaggregation processes.

The principal tools used are harmonic analysis, time series analysis, the ARMA processes, regression and correlation, principal component analysis, multivariate analysis, and disagregation processes. Data were used from 32 water-sheds in

the lower Ohio Basin located principally in Indiana, but also in Illinois, Ohio, and Kentucky. The conclusions are (1) the ARMA models with seasonally varying coefficients are based upon the seasonally varying serial correlation coefficients. The seasonality of the means, variances, and the cross-covariances can be preserved by using this family of ARMA models with seasonally varying parameters; (2) the parameters of the ARMA models for the stochastic component of the stream runoffs are correlated with some of the reional variables. Their correlations depend on the physiographical regions of the watersheds, are not significantly high but not negligible; (3) the ARMA processes can not preserve the long-term dependence of the hydrologic processes, therefore, for data synthesis, the multivariate disaggregation model should be used. The multivariate disaggregation model preserves long-term properties, within-the-year cyclicities, serial correlation, cross-correlation between stations, and rainfall-runoff relationships of the hydrologic processes.
W75-11783

HYDROCHEMICAL AND HYDROBIOLOGICAL PECULIARITIES OF LIMANS IN THE DANUBE-DNIESTER INTERFLUVE, (IN UKRAINIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2K.
W75-11847

2F. Groundwater

IMPROVED APPLICATION OF GEOPHYSICS TO GROUNDWATER RESOURCE INVENTORIES IN GLACIATED TERRAINS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
J. M. Adams, W. J. Hinze, and L. A. Brown.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 879, $4.25 in paper copy, $2.25 in microfiche. Technical Report No 59, July 1975. 62 p, 20 fig, 4 tab, 18 ref. OWRT A-030-IND(1).

Descriptors: *Groundwater, *Bedrock, *Gravity studies, Glacial aquifers, Hydrogeology, Geophysics, Geologic control, *Indiana, Geologic mapping, Subsurface mapping, *Groundwater resources, Bedrock.
Identifiers: *Induced polarization, Tippecanoe County(Ind).

Geophysical mapping of buried bedrock topography plays an important role in groundwater resource inventories. The gravity method is an inexpensive reconnaissance tool. Where the density contrast between the bedrock and the overlying earth materials is constant, the bedrock elevation data obtained from drill holes, outcrops, and seismic studies combined with gravity data can be used to isolate the gravity effects from bedrock relief. A limitation of the method is the number of bedrock elevation points available to compare with observed gravity data. In the area under study, 15 control points per township were found to be adequate. Preliminary induced polarization (I. P.) studies indicate that measurable I.P. effects occur within glacial sediments. Although the studies were inconclusive in defining the application of the I.P. method to determine the hydrologic properties of the sediments, the results suggest that further investigation of the method in this application is warrented.
W75-11355

SOLUTION OF A FREE-SURFACE BOUNDARY VALUE PROBLEM USING AN INVERSE FORMULATION AND THE FINITE ELEMENT METHOD,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Shaug, and J. C. Bruch, Jr.
Journal of Hydrology, Vol 26, No 1/2, p 141-152, July 1975. 3 fig, 1 tab, 10 ref. UCAL-WRC-W-428.

Descriptors: *Fluid mechanics, *Boundary processes, *Finite element analysis, *Seepage, *Algorithms, Ditches, Potential flow, Flow nets, Mathematics, Digital computers.
Identifiers: *Equipotential lines, Flow lines, Finite difference equations.

An inverse formulation in conjunction with the finite element method was used to solve a two-dimensional free surface problem. The approach is accurate and has several advantages over the finite difference solution approach. The scheme is easily formulated, efficient, and flexible since it can readily handle the boundary conditions and also any variable shaped curve within the rectangular regions in the complex potential plane. The solutions were performed on a digital computer for seepage from a trapezoidal ditch. The algorithm used allowed the streamlines and equipotential lines to be separated by arbitararily selected increments in the stream function and potential function so that these lines and their intersections could be concentrated in high velocity regions. Included were comparisons between finite element, finite difference, and analytical solutions which show the increased accuracy of the finite element method. (Singh-ISWS)
W75-11447

TRANSPORT MODEL, USER'S MANUAL,
Battelle-Pacific Northwest Labs., Richland, Wash. Water and Land Resources Dept.
For primary bibliographic entry see Field 5B.
W75-11468

VARIABLE THICKNESS TRANSIENT GROUNDWATER FLOW MODEL USER'S MANUAL,
Battelle-Pacific Northwest Labs., Richland, Wash. Systems Dept.
W. V. DeMier, A. E. Reisenauer, and K. L. Kipp.
Avaialble from the National Technical Information Service, Springfield, Va 22161. Battelle Report No BNWL-1704, UC-70, 1974. 94 p, 5 fig, 2 tab, 3 append. ERDA Contract AT9(45-1):1830.

Descriptors: *Groundwater, *Computer models, *Saturated flow, *Unsteady flow, Aquifers, Water table aquifers, Basins, Model studies, *Computer programs, Mathematical models, Flow.
Identifiers: Program listings, *User's manual, *Matrix inversion routine, Relaxation technique.

The Variable Thickness Transient Flow Model is a numerical solution to the partial differential equation describing unconfined saturated transient flow through porous media. The input to the model and two support programs used during a groundwater aquifer simulation were described. In addition to the program listings and user and input instructions, specific features relating to modeling of the Hanford Reservation groundwater regime were described. (Prickett-ISWS)
W75-11469

REGIONAL CHEMISTRY OF GROUNDWATER IN THE WAINWRIGHT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
D. A. Hackbarth.
Report 75-6, 1975. 49 p, 26 fig, 2 tab, 28 ref, 1 append. $2.00.

Descriptors: *Canada, *Hydrogeology, *Geochemistry, *Geologic control, Water quality, Bedrock, Glacial drift, Groundwater movement, Water table, Recharge, Discharge(Water), Artesian wells, Geomorphology, Topography, Regional analysis, Maps, Dissolved solids, Hardness(Water), Sodium, Potassium, Ion exchange, Sulfates, Fluorides, Chlorides, Nitrates, Water pollution, Alkalinity, Aquifers.
Identifiers: *Alberta.

The Wainwright map area (about 6000 sq mi) is located southeast of Edmonton between longitudes 110 degrees and 112 degrees west and latitudes 52 degrees and 53 degrees north, lying mostly in the aspen parkland vegetational assemblage. Average precipitation and potential evapotanspiration are 14 inches and 21 inches, respectively. Geologic units of hydrogeological interest include glacial drift, preglacial sands and gravels, and the Horseshoe Canyon, Bearpaw, Belly River, and Lea Park Formations. Contour maps of the following hydrochemical parameters for various depth intervals are presented: total dissolved solids, hardness, Na + K, alkalinity, S04, Cl, and F. Groundwater quality is related to the thickness and nature of the glacial drift and to the character of the underlying bedrock. Areas where the water quality is comparatively good for depths up to 500 feet are usually overlain by 50 to 400 feet of coarse-grained glacial drift. Rapid downward movement of water was hypothesized to account for this good quality. Poorer-quality groundwater is comonly found in areas of thin, fine-grained drift and is apparently the result of slow percolation. Regionally, the area acts as a recharge area for northwestwardly flowing groundwater; while locally, much water is probably discharged in sloughs. (Visocky-ISWS)
W75-11471

RESPONSE OF UNCONFINED AQUIFER SYSTEMS TO DEEP PERCOLATION,
California Univ., Davis. Dept. of Water Science and Engineering.
M. A. Marino.
Water Science and Engineering Paper No 2004, July 1975. 32 p, 3 fig, 16 ref. CSRS CA-D*-WSE-3082-H.

Descriptors: *Aquifers, *Groundwater recharge, *Water table, Equations, Mathematical models, Drains, Hydraulic conductivity, Irrigation, Groundwater, Groundwater movement, Porous media, Discharge(Water), Percolation, Seepage, Saturation, Water level.
Identifiers: *Mounds, Depth of saturation.

Solutions were derived which describe the rise and fall of the water table in extensive unconfined aquifers receiving localized vertical accretion and discharging into a surface reservoir in which the water level remains equal to that of the main flow before the incidence of rechange. The rate of accretion was maintained by a spreading area in the form of an infinitely long strip of finite width. Solutions were also derived for the rise, decline, and maximum height of the water table in an unconfined aquifer bounded by two streams or drains. The water levels in the drains were assumed to be at equal elevation. The aquifer received either time-varying or uniform vertical recharge. In each aquifer system considered herein, the aquifer was assumed to be homogeneous, isotropic, and resting on a horizontal impervious base. In addition, the rate of recharge relative to the hydraulic conductivity was considered so small that the vertically downward recharge was almost completely refracted in the direction of the slope of the water table. The solutions were expressed in terms of the head averaged over the depth of saturation. They are applicable to problems of groundwater flow through aquifers and to land drainage problems when the rise of the water table is smaller than 50% of the initial depth of saturation. (Visocky-ISWS)
W75-11474

HYDROGEOLOGY OF THE WAINWRIGHT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W75-11475

GEOHYDROLOGIC RECONNAISSANCE OF THE UPPER POTOMAC RIVER BASIN,
Geological Survey, Reston, Va.

F. W. Trainer, and F. A. Watkins, Jr.
Available from Supt of Documents, GPO, Washington, DC 20402, Price $1.95. Water-Supply Paper 2035, 1975. 68 p, 16 fig, 1 plate, 10 tab, 53 ref.

Descriptors: *Hydrogeology, *Geologic formations, *Water resources development, *Potomac River, *Appalachian Mountain region, Pennsylvania, Maryland, Virginia, West Virginia, Water resources, Water supply, Water utilization, Water quality, Groundwater, Surface waters, Aquifer characteristics, Water yield, Test wells, Streamflow, Low flow, Base flow, Water pollution sources, Watershed management, Hydrologic data.
Identifiers: *Upper Potomac River basin.

The upper Potomac River basin, in the central Appalachian region in Pennsylvania, Maryland, Virginia, and West Virginia, is a humid temperate region of diverse fractured rocks. Three geohydrologic terranes, which underlie large parts of the basin, are described in terms of their aquifer characteristics and of the magnitude and duration of their base runoff: (1) fractured rock having a thin regolith, (2) fractured rock having a thick regolith, and (3) carbonate rock. Crystalline rock in the mountainous part of the Blue Ridge province and shale with tight sandstone in the folded Appalachians are covered with thin regolith. Water is stored in and moves through fairly unmodified fractures. Average transmissivity (T) is estimated to be 150 sq feet per day, and average storage coefficient (S), 0.005. Crystalline and sedimentary rocks in the Piedmont province and in the lowland part of the Blue Ridge province are covered with thick regolith. Estimated average values for aquifer characteristics ar T, 200 sq feet per day, and S, 0.01 . Carbonate rock, in which fractures have been widened selectively by solution, especially near streams, has estimated average aquifer characteristics of T, 500 sq feet per day, and S, 0.03-0.04. This rock is the most effective in the basin in terms of water supply and base runoff. Acidic mine-drainage water, local highly mineralized groundwater, and the high nitrate content of groundwater in some areas would probably have little adverse affect on the use of groundwater for low-flow augmentation. (Woodard-USGS)
W75-11493

DIGITAL-SIMULATION AND PROJECTION OF WATER-LEVEL DECLINES IN BASALT AQUIFERS OF THE ODESSA-LIND AREA, EAST-CENTRAL WASHINGTON,
Geological Survey, Reston, Va.
J. E. Luzier, and J. A. Skrivan.
Available from Supt of Documents, GPO, Washington, DC 20402 Price - 75 cents. Water-Supply Paper 2036, 1975. 48 p, 29 fig, 12 ref.

Descriptors: *Groundwater resources, *Model studies, *Aquifer characteristics, *Basalts, *Washington, Water supply, Water utilization, Hydrogeology, Hydrologic data, Groundwater movement, Water yield, Groundwater recharge, Computer models, Forecasting, Water levels, Water resources development.
Identifiers: *Odessa-Lind area(Wash).

A digital computer program using finite-difference techniques simulates an intensively pumped, multilayered basalt-aquifer system near Odessa, Wash. The aquifers now developed are in the upper 1,000 feet of a regionally extensive series of southwesterly dipping basalt flow of the Columbia River Group. Most of the aquifers are confined. Those in the depth range of about 500 to 1,000 feet are the chief source of groundwater pumped from irrigation wells. Transmissivity of these aquifers ranges from less than 2,700 sq. ft. per day to more than 40,000 sq. ft. per day, and storage coefficients range from 0.0015 to 0.006. Shallower aquifers are generally much less permeable, but they are a source of recharge to deeper aquifers with lower artesian heads; vertical leakage occurs along joints in the basalt and down uncased wells, which short circuit the aquifer system. For model analysis, the deeper, pumped aquifers were grouped and treated as a single layer with drawdown-dependent leakage from an overlying confining layer. Verification of the model was achieved by closely matching observed pumpage-related head declines ranging from bout 10 feet to more than 40 feet over the 4-year period from March 1967 to March 1971. Projected average annual rates of decline during the 14-year period from March 1967 to March 1981 are: from 1 to 9 feet per year if pumpage is maintained at the 1970 rate of 117,000 acre-feet per year; or, from 3 to 33 feet per year if 1970 pumpage is increased to 233,000 acre-feet per year, which includes 116,000 acre-feet per year covered by water-right applications held in abeyance. (Woodard-USGS)
W75-11494

GROUND-WATER DATA FOR BOLIVAR COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-11496

GROUND-WATER DATA IN THE HARRISBURG - HALSEY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 7C.
W75-11498

GROUND-WATER LEVELS IN LOUISIANA--FOR WELLS MEASURED THROUGH 1974.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W75-11499

SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
A. G. Smajstrla, D. L. Reddell, and E. A. Hiler.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-2015. 30 p, 9 fig, 27 ref, append.

Descriptors: *Infiltration, *Soil water movement, *Porous media, *Computer programs, Simulation analysis, Model studies.

A simulation model was developed for the miscible displacement of a conservative solute during one-dimensional vertical infiltration into a homogeneous, isotropic porous media. FORTRAN IV computer programs were written in a general form so that various initial and boundary conditions could be specified as input parameters. Unsteady vertical infiltration, steady flow dispersion, and dispersion during unsteady vertical infiltration into unsaturated, homogeneous, and isotropic porous media were accurately described by the simulation model. The shape of the solute distribution curve with depth is relatively insensitive to the magnitude of the dispersion coefficient for porous media to which the functional relationship used apply and for the range of pore water velocities commonly encountered during infiltration into sand and clay loam soils. Dispersion coefficients are much larger and solute curves are very different for nonhomogeneous, anisotropic porous media than for homogeneous media. Data describing the nonhomogeneous nature of soils will be needed to adequately describe experimental field solute distribution curves. (Skogerboe-Colorado State)
W75-11590

MATHEMATICAL MODELS OF ARTIFICIAL RECHARGE SYSTEMS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 4B.
W75-11626

WELL PUMPING IN UNCONFINED AQUIFERS: THE INFLUENCE OF THE UNSATURATED ZONE,
Technion-Israel Inst. of Tech., Haifa. Faculty of Civil Engineering.
For primary bibliographic entry see Field 4B.
W75-11631

AXISYMMETRIC SEEPAGE FLOW THROUGH SEMI-INFINITE POROUS MEDIA,
Roorkee Univ. (India). Dept. of Hydrology.
S. Chandra, and H. C. Misra.
Indian Geotechnical Journal, Vol 4, No 4, p 299-311, October 1974. 10 fig, 7 ref.

Descriptors: *Porous media, *Seepage, *Mathematical studies, *Steady flow, *Flow around objects, Groundwater, Confined water, Potential flow, Flow, Groundwater movement, Groundwater potential, Underseepage, Numerical analysis, Laplaces equation, Resistance networks.
Identifiers: *Axisymmetric flow, *Semi-infinite flow, Potential distribution.

The potentials due to three-dimensional seepage in half space with infinite depth of the medium are higher than those for two-dimensional seepage under the downstream half of the floor. Under the upstream half of the floor the potentials are lower than those for the two-dimensional case. By increasing the length to width ratio, the potentials increase for the downstream half of the floor and decrease for the upstream half. This was confirmed by experiment also. The reduction in depth of the pervious stratum was found to reduce the potentials on the downstream half of the floor and increase on the upstream half of the floor. Two-dimensional seepage was similar. (Prickett-ISWS)
W75-11633

TWO-DIMENSIONAL SIMILARITY SOLUTION: THEORY AND APPLICATION TO THE DETERMINATION OF SOIL-WATER DIFFUSIVITY,
Connecticut Agricultural Experimental Station, New Haven. Dept. of Ecology and Climatology.
For primary bibliographic entry see Field 2G.
W75-11640

GEOCHEMISTRY AND GENSIS OF FLUORIDE-CONTAINING GROUND WATERS IN INDIA,
Soil Research Lab., Chandigarh (India).
For primary bibliographic entry see Field 2K.
W75-11645

THEORY OF GROUND-WATER RECHARGE FOR A STRIP BASIN,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
A. C. Amar.
Ground Water, Vol 13, No 3, p 282-292, May-June 1975. 9 fig, 16 ref, 2 append.

Descriptors: *Groundwater recharge, *Recharge, *Groundwater, Groundwater movement, Dupuit-Forchheimer theory, Saturated flow, Recharge ponds, Unsteady flow, Water table, Permeability, Mathematical models.
Identifiers: *Strip basin, *Recharge basin.

Formulation and solution of one-dimensional analytical and computational models, linear as well as nonlinear, pertaining to a typical groundwater recharge pattern were presented. The objective was to direct attention toward an evaluation

and correlation of the various theoretical models based on the Dupuit-Forchheimer (D-F) approximations for the unsteady hydrodynamic behavior of the proposed recharge system under saturated flow conditions. Comparisons with the pertinent experimental data, presented in the form of dimensionless graphs, indicated that the linear D-F theory is valid for relatively small water table rises but for large rises it predicts substantially greater rises than actually occur, particularly beneath and in the vicinity of the recharge basin. For relatively large rises, the range of validity between theory and experiments was considerably improved using the nonlinear theory. (Lee-ISWS)
W75-11646

DETERMINING OPTIMAL WELL DISCHARGE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4B.
W75-11768

IDENTIFICATION OF PARAMETERS IN A LINEAR EQUATION OF GROUNDWATER FLOW,
Department of the Environment, Reading (England). Central Water Planning Unit.
D. A. Nutbrown.
Water Resources Research, Vol 11, No 4, p 581-588, August, 1975. 12 fig, 5 ref, 1 append.

Descriptors: *Groundwater movement, *Hydrologic data, *Systems analysis, *Computer models, *Aquifer systems, Base flow, Model studies, Mathematical studies, Linear programming, Mathematical models, Finite element analysis, Analytical techniques, Transimissivity, Aquifer characteristics, Aquifers, Inflow, Groundwater recharge, Withdrawal.
Identifiers: England, South Downs(England), Linear equations.

An inductive method is presented for evaluating parameters in a two-dimensional linear equation describing groundwater flow. The approach employs finite difference approximations, which can be simply programmed for calculation by computer. Before illustrating the method, which is applicable to both stationary and time-dependent problems, the various types of data required for evaluation in general are systematically enumerated. An assumption is introduced limiting the local variability of T, the tranmissivity, and its relation to apparently similar assumptions used elsewhere is discussed. The particular aquifer chosen for illustration is the chalk of the South Downs between the rivers Adur and Ouse. The parameters are calculated on the basis of cyclic data in which annual abstraction is about 30% of the total infiltration for the year. The method gives a match to the minimum and maximum water levels during the year to within 7%. (Robinett-Arizona)
W75-11799

2G. Water In Soils

SOIL AND HYDROLOGIC FACTORS AFFECTING THE STABILITY OF NATURAL SLOPES IN THE OREGON COAST RANGE,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
R. D. Harr, and C. S. Yee.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 878, $7.25 in paper copy, $2.25 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-33, July 1975. 204 p, 54 fig, 10 tab, 87 ref, 4 append. OWRT A-023-ORE(1).

Descriptors: *Slope stability, Soil mechanics, Subsurface flow, *Soil aggregates, Oregon, Coasts, Hydrology, Piezometers, Particle size, Tensiometers, Soil properties, Soil strength, Porosity, *Soil stability, Soil density, *Soil physical properties, Cohesionless soils, *Oregon Coast Range.

Soil and hydrologic properties of two major cohesionless soils occupying 55% of the central portion of the Oregon Coast Range were examined. Knowledge of these properties was desired to determine the role each played in the stability of slopes in the region. Bohannon and Klickitat soils often occupy the steep midslopes where the greatest potential for stability problems exists. The Bohannon series is derived from Tyee sandstone and the Klickitat series is derived from intrusive, igneous parent material. Soil samples were obtained from four widely separated sites, two for each of the soil series and were examined for particle-size-distribution, bulk density, porosity, pore-size distribution, aggregate stability, saturated and unsaturated hydraulic conductivity, and shear strength. Both soils, although derived from very different parent materials, exhibited nearly identical ranges of values for soil and hydrologic properties. Both were extremely porous, highly permeable, very well aggregated and graded, sandy to gravelly cohesionless soils. From engineering and hydrology standpoints, the two soil series can be considered as one.
W75-11353

FIELD TEST OF SOIL WATER FLUX METERS,
Agricultural Research Service, Riverside Calif. Salinity Lab.
C. Dirksen.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-2039. 12 p, 4 fig, 1 tab, 5 ref.

Descriptors: *Soil water movement, *Drainage, Soil investigations, *Soil moisture, meters, Soil properties, *Instrumentation, *Measurement, *On-site tests.

Soil water flux in a draining soil profile was measured with flux meters featuring variable hydraulic resistances. As the hydraulic conductivity of the soil changes, the meter resistance is adjusted such that the overall hydraulic head loss across the meter matches that measured with tensiometers in undisturbed soil nearby. The soil water flux is then equal to that through the meter and is derived from the calibration of the resistance. If this match is not quite perfect, the remaining small amount of divergence or convergence of flow is calculated with an empirical relationship, independent of the magnitude of the flux and the hydraulic properties of the soil. The soil water fluxes were measured in essentially undisturbed soil, since the meters were installed from a horizontal direction. Such installation is possible by using a compression spring that pushes thin filter plates against the top and bottom of undisturbed soil surfaces excavated to a certain size with a specially designed apparatus. A slanted pin used to constrain the spring permits the meter to be installed and retrieved repeatedly. Two flux meters of different sizes and with different hydraulic resistances were tested side by side in a field plot and gave consistent, satisfactory results. (Skogerboe-Colorado State)
W75-11586

SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W75-11590

DETERMINING EFFECTIVE SOIL WATER DIFFUSIVITIES FROM ONE-STEP OUTFLOW EXPERIMENTS,
Minnesota Univ., St. Paul.
S. C. Gupta, D. A. Farrell, and W. E. Larson.
Soil Science Society of America Proceedings, Vol 38, No 5, p 710-716, September-October, 1974. 7 fig, 15 ref, append.

Descriptors: *Diffusivity, Methodology, Soil water, *Soil water movement, Soil properties, Computers, Discharge(Water).

A method is developed whereby effective or weighted mean diffusivity, D, can be estimated by using outflow data. These estimates can further be analyzed for soil water diffusivity, D theta, with the help of a step-wise function and the relationship given by Crank (1956). The suggested procedure for estimating soil water diffusivity is more accurate than previous methods because no assumption of constant diffusivity either over the pressure increment or over the length of the soil core is required. Moreover the procedure does not use the early part of the outflow curve and thus reduces the effect of membrane impedance on the estimates of D theta. The method was tested by simulating outflow experiments on a digital computer, and using data obtained to calculate diffusivities. Estimates of diffusivity were in better agreement with the actual diffusivities than those obtained with the earlier 'one-step' method. (Skogerboe-Colorado State)
W75-11592

UNSATURATED HYDRAULIC CONDUCTIVITY FROM CUMULATIVE INFLOW DATA,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
L. R. Ahuja.
Soil Science Society of America Proceedings, Vol 38, No 5, p 695-699, September-October, 1974. 6 fig, 13 ref.

Descriptors: *Hydraulic conductivity, *Infiltration, *Diffusivity, Soil properties, Clays.

A method of determining the wetting-phase unsaturated hydraulic conductivity K theta from the data of cumulative inflow into a uniform soil core when water enters through a porous plate of high hydraulic resistance is described and evaluated. The method is based on piece-wise application of the Green and Ampt (1911) approach to the above process of infiltration. The K theta determined by this technique from the numerical-solution inflow data of Yolo light clay were within 20% of the K theta values actually used in obtaining the numerical solution in two different cases of hydraulic resistance. Similar analysis of the experimental inflow data of Salkum silty clay loam for four different hydraulic resistances yielded the K theta data which closely agreed with the K theta values determined by detailed analysis of the soil-water content transients. (Skogerboe-Colorado State)
W75-11593

CHLORIDE AND TRITIATED WATER FLOW IN DISTURBED AND UNDISTURBED SOIL CORES,
Kentucky Univ., Lexington. Dept. of Agronomy.
M. A. McMahon, and G. W. Thomas.
Soil Science Society of America Proceedings, Vol 38, No 5, p 727-732, September-October, 1974. 6 fig, 4 tab, 13 ref.

Descriptors: *Soil water movement, Soil properties, Water chemistry, *Chlorides, Nitrates, Soil investigations, Soil physics, Anions.
Identifiers: *Tritiated water.

Columns of disturbed and undisturbed Eden, Maury, and Pembroke soils were eluted with CaCl2 in tritiated water. The chloride was used as a substitute for nitrate since it is not affected biologically. The experiments were carried out to investigate the effects of natural soil structure on the flow of water and chloride. In all three soils flow was less stable in the undisturbed cores judging from the shape of the curve and the points of initial tritiated water and chloride breakthrough.

Chloride moved through the undisturbed Eden and Maury soils faster than through the disturbed columns. Both soils exclude anions to a significant extent. In the Pembroke soil, which adsorbs anions, the chloride was retarded in the undisturbed column as compared to the disturbed column. The results suggest that field movement of water and anions is not described very well by columns of disturbed, packed soils. (Skogerboe-Colorado State)
W75-11594

PREDICTING EXCHANGEABLE SODIUM RATIOS IN IRRIGATED TROPICAL VERTISOLS,
Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 3C.
W75-11595

NITRIFICATION AND DENITRIFICATION DURING MISCIBLE DISPLACEMENT IN UNSATURATED SOIL,
California Univ., Davis.
For primary bibliographic entry see Field 3F.
W75-11596

RICE RESPONSE TO NITROGEN AND PHOSPHORUS IN FLOODED AND NONFLOODED SOILS,
National Fertilizer Development Center, Muscle Shoals, Ala.
For primary bibliographic entry see Field 3F.
W75-11597

MODIFIED PENMAN EQUATION TO PROVIDE THE UPPER BOUNDARY CONDITION IN COMPUTING EVAPORATION FROM SOIL,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 2D.
W75-11598

SAMPLING TOOL FOR TAKING UNDISTURBED SOIL CORES,
Florida Univ., Gainesville.
W. K. Robertson, P. E. Pope, and R. T. Tomlinson.
Soil Science Society of America Proceedings, Vol 38, No 5, p 855-857, September-October 1974. 4 fig, 2 ref.

Descriptors: *Sampling, *Soil investigations, Soil properties, Soil surveys, Soil tests, Leaching.

A tool is described that can be attached to a commercially available soil sampler that will take undisturbed soil cores 15 cm in diameter and 75 cm long in corlon tubes. The tubes were sealed at the bottom with a sheet of plastic in which drainage tubes were inserted. Leaching studies could be made when tubes containing cores were placed on racks in the greenhouse. Further refinements include suction cups at regular intervals in the side of the column for nutrient movement studies and porous plates at the top and/or the bottom to make moisture tension in the profile similar to natural conditions. (Skogerboe-Colorado State)
W75-11599

KINETIC AND EQUILIBRIUM STUDIES OF BORON DESORPTION FROM SOIL,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
R. A. Griffin, and R. G. Burau.
Soil Science Society of America Proceedings, Vol 38, No 6, p 892-897, November-December, 1974. 6 fig, 2 tab, 19 ref.

Descriptors: Boron, Adsorption, *Kinetics, Soil texture, *Soil chemistry, Soil tests, Soil investigations, *Equilibrium.
Identifiers: *Boron desorption.

Kinetics of boron desorption from soil were determined using 0.05M mannitol solutions to create pseudo first-order reaction conditions. The results showed two separate pseudo first-order reactions and one very slow reaction for which detailed kinetic treatment was not attempted. The relative amount of boron associated with the two fast reactions was independent of soil texture and of initial sample boron content. It was postulated that the two reaction rates were due to desorption from two independent boron retention sites. It was speculated that the two fast reactions were due to desorption from hydroxy iron, magnesium, and aluminum materials in the clay fraction. The third or slowest reaction rate was probably due to diffusion of boron from the interior of clay minerals to solution phase. Equilibrium studies showed that boron desorption followed a 2-site analog of a linear form of a 1-site Langmuir expression. Langmuir adsorption maximum values for each site corroborated those calculated from the kinetic study and supported the multisite interpretation of the kinetic data. (Skogerboe-Colorado State)
W75-11600

SULFUR AND MANGANESE RELEASE FROM SOILS TREATED WITH PRILLED SULFUR AND SULFUR-BENTONITE,
Missouri Univ., Clinton. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-11604

TWO-DIMENSIONAL SIMILARITY SOLUTION: THEORY AND APPLICATION TO THE DETERMINATION OF SOIL-WATER DIFFUSIVITY,
Connecticut Agricultural Experimental Station, New Haven. Dept. of Ecology and Climatology.
N. C. Turner, and J-Y. Parlange.
Soil Science Society of America Proceedings, Vol 39, No 3, p 387-390, May-June 1975. 3 fig, 1 tab, 5 ref.

Descriptors: *Soil water, *Infiltration, *Infiltration rates, Diffusion, Moisture content, Sands.
Identifiers: *Soil water potential, *Moisture profile, *Soil-water diffusivity, Bruce and Klute method, Similarity solution.

A similarity solution exists in two-dimension when a constant flux is imposed along a line source. Following the Bruce and Klute method in one-dimension, this similarity solution can be used to determine the soil water diffusivity. The application of the method was illustrated for a sandy loam. The advantage of the method is that the slope of the moisture profile is finite and easily measured, even close to the source. (Lee-ISWS)
W75-11640

NUTRIENT TRANSPORT IN SURFACE RUNOFF AS INFLUENCED BY SOIL COVER AND SEASONAL PERIODS,
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 5B.
W75-11641

EVAPOTRANSPIRATION AND SOIL MOISTURE IN UPLAND GRASS CATCHMENTS IN THE EASTERN PENNINES,
Leeds Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2D.
W75-11648

SOIL MOISTURE ACCOUNTING COMPONENT OF THE USDAHL-74 MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
C. B. England.
Water Resources Bulletin, Vol 11, No 3, p 559-567, June 1975. 3 fig, 1 tab, 7 ref.

Descriptors: *Soil moisture, *Model studies, *Hydrologic data, *Watershed management, *Hydrographs, Soil management, Moisture content, Moisture, Computer models, Streamflow forecasting, Soil water movement, Soil-water-plant relationships, Soils, Subsurface waters, Watersheds(Basins), *Oklahoma.
Identifiers: *Model sensitivity analysis, *Chickasha(Okla), Layered soils.

Soil moisture in two layers of a soil near Chickasha, Oklahoma, was simulated using the USDAHL-74 Model of Watershed Hydrology. Weekly values computed for both layers compared well with those observed during a 15-month period. Certain key parameters required adjustments in the model which illustrate the need for accurate input information. The experiment demonstrated that the model, which has previously given good results in continuous streamflow prediction on watersheds up to 100 square miles, could also compute soil moisture continuously at a site. This capability suggested other model uses, for example, in monitoring the disposition of applied chemicals. (Prickett-ISWS)
W75-11656

DISPOSAL OF CHEMICAL SEWAGE SLUDGES ON LAND AND THEIR EFFECTS ON PLANTS, LEACHATE AND SOIL SYSTEMS,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
For primary bibliographic entry see Field 5E.
W75-11721

SOIL TREATMENT WITH SILICONES FOR WATER HARVESTING,
Dow Corning Corp., Midland, Mich.
For primary bibliographic entry see Field 3B.
W75-11806

CHEMICAL WATER HARVESTING,
DeJong and Associates, Tucson, Ariz.
For primary bibliographic entry see Field 3B.
W75-11807

DESIGN AND CONSTRUCTION OF ROADED CATCHMENTS,
Western Australia Dept. of Agriculture, Moora. Soil Conservation Service.
For primary bibliographic entry see Field 3B.
W75-11810

PRECIPITATION ENTRAPMENT FOR EVAPORATION SUPPRESSION,
Agricultural Research Service, Orono, Maine. Soil, Water and Air Sciences.
For primary bibliographic entry see Field 3B.
W75-11822

DIFFERENT SOIL TREATMENTS FOR HARVESTING WATER FOR RADISH PRODUCTION IN THE MEXICO VALLEY,
Escuela Nacional de Agricultura, Chapingo (Mexico). Dept. of Soils.
For primary bibliographic entry see Field 3B.
W75-11829

A STEADY-STATE MODEL OF ISOTOPIC FRACTIONATION ACCOMPANYING NITROGEN TRANSFORMATIONS IN SOIL,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 5B.
W75-11831

RATE OF PHOSPHORUS SORPTION BY FIVE OKLAHOMA SOILS,
Robert S. Kerr Environmental Research Lab., Ada, Okla. National Water Quality Control Research Program.

For primary bibliographic entry see Field 3F.
W75-11836

2H. Lakes

OLIGOCHAETES IN THE BOTTOM FAUNA AND STOMACH CONTENT OF TROUT, SALMO TRUTTA (L.),
Zoologisk Museum, Oslo (Norway).
F. Aarefjord, R. Borgstrom, L. Lien, and G. Milbrink.
Norw J Zool, Vol 21, No 4, p 281-288, 1973. Illus.

Descriptors: *Brown trout, *Oligochaetes, *Benthic fauna, Lakes, *Fish food organisms, Trout.
Identifiers: *Eiseniella-tetraedra, Enchytraeids, Peloscolex-ferox, Stylaria-lacustris, Stylodrilus-heringianus, Tubifex-tubifex.

The limnic oligochaetes Eiseniella tetraedra, Peloscolex ferox, Stylodrilus heringianus, Tubifex, turifes, Stylaria lacustris and at least 2 euchytraeids were found in the investigated lakes. E. tetraedra was the only limnic species recorded in the stomach content of trout. The study indicated that oligochaetes may be an important food item to trout during the period March-July.--Copyright 1974, Biological Abstracts, Inc.
W75-11385

PHYSICOCHEMICAL PROPERTIES OF DREDGE SPOIL,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11465

GENERATION OF HYDROLOGIC SAMPLES: CASE STUDY OF THE GREAT LAKES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
Hydrology Papers No 72, May 1975. 39 p, 58 fig, 28 tab, 8 ref. NSF GK-31521X, DAC-23-72-C0042.

Descriptors: *Time series analysis, *Great Lakes, *Synthetic hydrology, *Computers, *Analytical techniques, *Lake Erie, *Lake Ontario, Statistical methods, Flow, Water storage, Frequency, Distribution patterns, Retardance, Channels, Water supply.
Identifiers: *Flow retardation, Autocorrelation, Principal component analysis.

Statistical tests were performed and 20 samples, each 50 years long, were generated in respect to three variables related to water inputs and retardation of flows in connecting channels of the Great Lakes. The three variables were mean monthly net basin water supplies of five lakes, mean quarter-monthly net basin water supplies of lakes Ontario and Erie, and flow retardations in connecting channels because of freezing and weed effects. Periodic parameters in all three variables were found to be the mean and the standard deviation. The autocorrelation coefficients and skewness coefficients were found not to be periodic. The stochastic components, after the periodic mean and standard deviation were identified and removed, were found to be greatly autocorrelated. The simple first- and second-order autoregressive linear models were found sufficient to describe these tendencies. The principal component analysis was used in generating the new samples of the mean monthly net basin supplies. (Singh-ISWS)
W75-11476

NATURAL AND ACCELERATED PHOSPHATE MOBILITY, (IN DUTCH),
For primary bibliographic entry see Field 5C.
W75-11520

PHYTOPLANKTON IN LAKE MASCARDI (RIO NEGRO, ARGENTINA), (IN SPANISH),
Institute National de Limnologie, Santo Tome (Argentina).
For primary bibliographic entry see Field 5C.
W75-11532

DETERMINATION OF THE APPARENT COMPLEXING CAPACITY OF LAKE WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11538

A FOOD WEB MODEL FOR LAKE MICHIGAN PART 2-MODEL FORMULATION AND PRELIMINARY VERIFICATION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W75-11547

WATER QUALITY RELATIONSHIPS IN THE GREAT LAKES: ANALYSIS OF A SURVEY QUESTIONNAIRE,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-11549

GREAT LAKES WATER LEVELS, 1974, DAILY AND MONTHLY AVERAGE WATER SURFACE ELEVATIONS.
NOAA National Ocean Survey, Washington, D.C.
Availability statement for sale by Lake Survey Center, 630 Federal Building and U.S. Courthouse, Detroit, MI 48226, for $2.50. May 1975. 106 p.

Descriptors: *Great Lakes, *Water levels, Water control, *Gaging stations, *Water levels fluctuation, Water level recorders, Flow measurement, Lakes, Water analysis, Gages, Measurement, Elevation, Fluctuations.
Identifiers: Water elevations, *Water level gages, Lake levels, Lake elevations.

This publication contains Lake Survey Center Great Lake water-level gage records and shows in tabular form daily and monthly average levels for each gage in the network for the calendar year. It also contains, in a separate table, the highest and lowest daily average for the month. In addition a frequency distribution table of daily average levels shows the number of times each month the recorded levels were above a specified elevation. The gages record water levels in either analog or a digital form on strip charts that are retained for a period of 10 years. Recorded hourly values were used to compute the daily averages, and the monthly values were compiled from the daily averages. (NOAA)
W75-11554

SOURCES OF WATER QUALITY, LAKE LEVEL, ICE, WATER TEMPERATURE AND METEOROLOGICAL DATA FOR THE ST. LAWRENCE GREAT LAKES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
A. M. Beeton, and J. W. Strand.
Sea Grant Advisory Rpt. No. 10, January 1975. 193 p.

Descriptors: *Great Lakes, *Water quality, *Data collections, *Hydrologic data, *Hydrography, *Meteorological data, *Meteorology, *Lakes, Water analysis, Water chemistry, Water levels, Water level fluctuations, Height, Measurement, Limnology, Hydrologic aspects, Climatic data, On-site data collections, On-site investigations, Regional analysis, Hydrologic properties, Ice cover, Lake ice, Water temperature, Aquatic environment, Physical properties, Monitoring.
Identifiers: Data sources, Water quality data, Lake levels, Hydrographic records, Meteorological records, Ice measurement.

Data sources included in this and the proceeding report (Powers, Jones, and Ayers, 1959) are municipal, industrial, power plant and a few military water treatment plants. Published water quality data from academic, governmental or private sources were not included. The data sources have not been used by many investigators because of the inaccessibility of the data or many people were not aware of its existence. This report provides information on sources of raw numerical data. It gives qualitative not quantitative information. The report is divided into two parts; hydrographic and meteorological. The hydrographic section deals with water intakes in one of the five Great Lakes or their interconnecting waterways. The St. Lawrence River was not included as part of the study. The meteorological section includes those weather stations around the Great Lakes up to a distance of 125 miles inland. (NOAA)
W75-11567

THE COASTS OF WISCONSIN,
Wisconsin Univ., Madison. Sea Grant Program.
J. Napoli.
March 1975. 38 p. WIS-SG-75-122.

Descriptors: *Coasts, *Great Lakes, *Lake Superior, *Lake Michigan, Lakes, Bodies of water, Land management, Conservation, Land use, *Wisconsin.
Identifiers: *Coastlines, *Coastal zones, Coastal zone management.

This brief report takes a look at the Great Lakes coast of Wisconsin. The physical characteristics of Lakes Superior and Michigan are described as are the history and development of their coasts. A section is also devoted to current uses and problems encountered in coastal areas. A special section is devoted to the management of Wisconsin's coasts and what the future may hold in store for the coasts development. (NOAA)
W75-11569

GREAT LAKES ICE COVER, WINTER 1973-74,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 2C.
W75-11572

ANALYSIS OF INTERNATIONAL GREAT LAKES SHIPPING AND HINTERLAND,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 6C.
W75-11576

APPLICATION OF A GENERALISATION OF WALD'S IDENTITY TO SOLVING CERTAIN MULTI-STREAM STORAGE PROBLEMS,
Monash Univ., Clayton (Australia). Dept. of Mathematics.
For primary bibliographic entry see Field 4A.
W75-11649

ANALYSIS OF PLUNGING PHENOMENA IN WATER RESERVOIRS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 4A.
W75-11655

DEVELOPMENT PLANNING OF LAGUNA DE BAY--PHILIPPINES,
Laguna Lake Development Authority, Manila (Philippines).
For primary bibliographic entry see Field 4A.
W75-11770

Group 2I—Water In Plants

DIURNAL PATTERNS OF WATER POTENTIAL IN ABIES CONCOLOR AND PINUS PONDEROSA,
Canterbury Univ., Christchurch (New Zealand). School of Forestry.
J. E. Barker.
Can J For Res, Vol 3, No 4, p 556-564, 1973. Illus.

Descriptors: *Diurnal distribution, *Ponderosa pine trees, Coniferous trees, *White fir trees, Soil moisture, Stomata.
Identifiers: Stomatal aperture.

Diurnal patterns of water potential for A. concolor and P. ponderosa were studied in relation to concurrent environmental conditions. Up to 86% of variation in water potential was accounted for using irradiance, square root of vapor pressure deficit, height and stomatal aperature as independent variables in A. concolor while up to 76% was accounted for in P. ponderosa using the same variables. Under comparable environmental conditions, A. concolor experienced lower water potentials than P. ponderosa due to its relative lack of stomatal control and its greater sensitivity to changes in vapor pressure deficit. Height effects were very nearly identical to those predicted by the cohesion theory. A procedure for estimating available soil moisture is suggested.--Copyright 1974, Biological Abstracts, Inc.
W75-11382

CONTRIBUTION TO THE ECOLOGY OF INDIAN AQUATICS: IV. RATE OF DRY MATTER PRODUCTION OF THE LEAVES OF SEVERAL COMMON AQUATIC PLANTS OF GORAKHPUR (INDIA),
Saint Andrews Coll., Gorakhpur (India). Dept. of Botany.
A. B. Sinha, and R. Sahai.
Photosynthetica (Prague), Vol 8, No 2, p 127-129, 1974.

Descriptors: Ecology, *Aquatic plants, Cultures, *Leaves, Respiration, *Plant physiology, Stomata, Production.
Identifiers: Aponogeton-natans, *Dry matter production, Eichhornia-crassipes, *India(Gorakhpur), Marsiles-minuta, Nymphaea-stellata, Nymphoides-cristatum, Salvinia-natans.

Dry matter accumulation per unit area of leaves of 6 common aquatic plants of Gorakhpur (India), viz., Eichhornia crassipes, Salvinia natans, Nymphaea stellata, Nymphoides cristatum, Aponogeton natans and Marsilea minuta was determined under laboratory conditions by the leaf disc method. Maximum rate of net production (1.43 g dry matter m-2 h-1) was found in E. crassipes, while M. minuta has the minimum rate (0.81 g dry matter m-2 h-1). The respiratory loss of dry matter was greatest in E. crassipes (0.56 g dry matter m-2 h-1) and minimum (0.16 g dry matter m-2 h-1) in A. natans. The stomatal frequency of the leaves has no definite influence on the rate of dry matter accumulation in these plants.--Copyright 1974, Biological Abstracts, Inc.
W75-11386

A WATER POTENTIAL THRESHOLD FOR THE INCREASE OF ABSCISIC ACID IN LEAVES,
New York State Cooperative Extension Service, Penn Yan.
T. J. Zabadal.
Plant Physiol, Vol 53, No 1, p 125-127, 1974, Illus.

Descriptors: *Leaves, Acids, Dehydration, Stomata, *Plant physiology.
Identifiers: *Abscisic acid, *Ambrosia-artemisifolia, *Ambrosia-trifida.

A relationship between abscisic acid concentration and leaf water status is reported. Water potentials were measured in leaves of Ambrosia artemisiifolia L. and A. trifida L. throughout a period of dehydration of intact plants. Tissues from the same leaves were analyzed for abscisic acid. For both species, abscisic acid began to increase in a critical water potential range (-10 to -12 atmospheres). These data suggest a threshold water potential that stimulates abscisic acid synthesis. The data support the hypothesis that a small change in water potential could affect stomatal resistance to water loss by means of very sensitive chemical feedback control mechanism.--Copyright 1974, Biological Abstracts, Inc.
W75-11394

HABITAT HETEROGENEITY AND AVIAN COMMUNITY STRUCTURE IN NORTH AMERICAN GRASSLANDS,
Oregon State Univ., Corvallis. Dept. of Zoology.
J. A. Wiens.
Am Midl Nat. Vol 91, No 1, p 195-213, 1974, Illus.

Descriptors: *Birds, *Habitats, *Wildlife habitats, *Populations, *Environmental effects, Food and cover crops, Brushlands, *Grasslands, Analysis.
Identifiers: Steppe, *Bird populations, Vegetational heterogeneity.

In a variety of environments, patchiness of habitat structure appears related to faunal diversity. The relations between vegetational heterogeneity and several attributes of avian communities over a range of North American grassland and shrub steppe situations were examined. Habitat heterogeneity was measured by assessing the variability in vertical density of vegetation within clustered point samples and an index to express this horizontal patchiness was derived. Heterogeneity was directly related to the areal coverage of bare ground and woody vegetation and to patchiness in litter distribution of sample plots and inversely related to grass coverage and litter depth. Heterogeneity generally increased with decreasing annual precipitation and primary production, tall grass-prairie sites being the least and western shrub steppe the most heterogeneous. Analysis of breeding bird population censuses from these plots revealed no apparent relationships between habitat heterogeneity and the diversity of breeding avifaunas or the extent of spatial (territorial) overlap between species. The density of breeding bird populations decreased slightly with increasing vegetation patchiness; the standing crop biomass of the avian community, however, decreased markedly as heterogeneity increased. This pattern appeared to result from a replacement of large-sized species by medium-sized species in the transition from tall grass to short grass areas and an increasing dominance of small-sized species in the western Palouse and shrub steppe sites.--Copyright 1974, Biological Abstracts, Inc.
W75-11425

TRANSPIRATION OF SOME OREOXEROPHYTES OF THE CENTRAL CAUCASUS, (IN GEORGIAN),
For primary bibliographic entry see Field 2D.
W75-11442

A METHOD OF INVESTIGATING POPULATIONS OF DIATOMS IN FLOWING WATERS, (IN GERMAN),
A. Mueller-Haeckel.
Oikos, Vol 25, No 3, p 331-334, 1974. Illus.

Descriptors: *Diatoms, Methodology, Plankton, Standing crops, *Systematics, Seasonal, Analytical techniques, *Microscopy.
Identifiers: Cuvettes, *Synedra-ulna.

A constant flow of stream water was maintained through a modified plankton microscope cuvette. Cells of Synedra ulna Ehr. were counted over a 20 mm2 area of the cuvette each day. Population development was similar to that occurring in streams. Standing crop depended on drifting, colonizing cells and cell division, but was influenced by seasonal factors.--Copyright 1975, Biological Abstracts, Inc.
W75-11445

STUDIES OF FLOODPLAIN VEGETATION AND WATER LEVEL FLUCTUATION IN THE KISSIMMEE RIVER VALLEY,
Central and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept.
For primary bibliographic entry see Field 4A.
W75-11628

SPAWNING GROUNDS OF THE EUROPEAN WALLEYE LUCIOPERCA LUCIOPERCA L. AND VOLGA WALLEYE LUCIOPERCA VOLGENSIS (GMELIN) IN THE URAL RIVER (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Evolutionary Morphology and Animal Ecology.
E. N. Dmitrieva.
Vopr Ikhtiol. Vol 13, No 5, p 934-937, 1973, Illus.

Descriptors: *Walleye, *Fish behavior, Fish eggs, *Spawning, *Fish reproduction, Rivers, Europe, Asia.
Identifiers: Lucioperca-lucioperca, Lucioperca-volgensis, *USSR, Volga River, Ural River, Kazakh SSR, European walleye, Volga walleye.

In the Ural River (Kazakh SSR, USSR) the Volga walleye (Lucioperca volgensis) spawns simultaneously with the European walleye (L. lucioperca) on the same spawning grounds. The largest spawning grounds of both walleyes are located in the region of the Inderborskii and Krasnye Yary; they are located along sandy shoals near the banks. The females of the Ural European walleye make nests and guard and aerate the eggs deposited on root hairs. The females of the Volga walleye also make nests and their behavior during the period of protection of the eggs is similar to the behavior of the female European walleye.--Copyright 1975, Biological Abstracts, Inc.
W75-11668

EFFECT OF WATER STRESS, TEMPERATURE, AND LIGHT ON PHOTOSYNTHESIS IN ALDER SEEDLINGS,
Helsinki Univ. (Finland). Dept. of Silviculture.
P. Hari, and O. Luukkanen.
Physiol Plant, Vol 29, No 1, p 45-53, 1973. Illus.

Descriptors: Carbon dioxide, *Seeds, *Photosynthesis, Temperature, Plant management, Light, Mathematical models.
Identifiers: *Alderseedlings, Alnus-incana.

Seedlings of Alnus incana (L.) Moench were studied in controlled environmental conditions. Net photosynthetic capacity of 4 plants simultaneously as well as light, temperature, and atmospheric water pressure deficit were continuously recorded during approximately 2 mo. The potted plants were continuously given known quantities of water. Two different effects of water stress were found in the experimental plants. When sufficient amounts of water had been available to them, photosynthetic CO2 fixation rates largely followed the variation in temperature and light. On the other hand, after prolonged water stress, higher temperatures caused a large decrease in net CO2 uptake even if the plant apprently had sufficient water during the actual measurements. Possible mechanisms for this effect are discussed. Effects of water stress on photosynthesis were studied at a constant temperature as well as in conditions where temperature, light, soil water content, and atmospheric water vapor pressure were allowed to vary in a complex pattern. Mathematical models for expressing net CO2 uptake as a function of environmental variables were constructed for both

of these experimental situations. However, only the latter approach clearly domonstrated the fundamental role of temperature in controlling the photosynthesis of plants under water stress.--Copyright 1974, Biological Abstracts, Inc.
W75-11691

2J. Erosion and Sedimentation

SOIL AND HYDROLOGIC FACTORS AFFECTING THE STABILITY OF NATURAL SLOPES IN THE OREGON COAST RANGE,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 2G.
W75-11353

TURBULENT ENTRAINMENT ACROSS STABLE DENSITY STEP STRUCTURES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography.
E. J. Wolanski, and L. M. Brush, Jr.
Tellus, Vol 27, No 3, p 259-268, 1975. 8 fig, 1 tab, 23 ref. NSF Grant GK-18780.

Descriptors: *Density, *Thermocline *Entrainment, *Mixing, Interfaces, Fluid mechanics, Sediments, Sediment transport, Buoyancy, Suspended solids, *Turbulence, Suspension, Internal waves, Atmosphere, Model studies, Density stratification, Laboratory tests, Oceanography, Meteorology, Energy.
Identifiers: *Turbulent entrainment, *Density layers.

Research was summarized on the properties of the turbulent entrainment across stable density-stratified layers, a phenomenon commonly observed in geophysical fluid dynamics. A turbulent environment was created by oscillating grids in quasi-homogeneous layers of slightly different density separated by thin sheets of fluid containing a strong density gradient. The buoyancy flux across thin stable layers was found to be a function of the Richardson and Prandtl numbers. Theoretical and experimental studies were made, leading to a determination of the order of magnitude of the four terms expressing the balance of energy in physical space. It was shown that the turbulent energy flux is of the same order of magnitude as the viscous dissipation of kinetic energy in the quasi-homogeneous layers where the slight density gradient is not altogether negligible because a small but measurable fraction of the turbulent energy flux goes into maintaining the buoyancy flux. Data taken in the stable layer showed the simultaneous existence of large internal waves and patchy turbulence. Some properties of these waves as functions of the Richardson number were determined. (Sims-ISWS)
W75-11451

SEDIMENT TRANSPORT THEORIES: A REVIEW,
Hydraulics Research Station, Wallingford (England).
W. R. White, H. Milli, and A. D. Crabbe.
The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 265-292, June 1975. 12 fig, 5 tab, 48 ref.

Descriptors: *Sediment transport, *Sediment discharge, *Sedimentation rates, Sediments, Hydraulics, Bed load, Stream erosion, Streambeds, Streams, Width, Shear, Velocity, Particle size, *Reviews.
Identifiers: *Sediment transport theories.

Eight sediment transport theories were examined with reference to flume and field data. The comparison was based on over 1000 flume experiments (quartz and lightweight materials) and 260 field measurements. Froude numbers greater than 0.8 were excluded and no allowance was made for wall effects and bank friction. The available data were classified in terms of the dimensionless parameters of grain size, mobility number, flow depth, and relative density. The characteristics of the flume and field data very considerably in terms of the breadth/depth ratio. Depth/diameter ratios for flume data are generally much lower than those for the field data for similar dimensionless particle size. There is a significant lack of field data in the range of 1.5-20 mm sand sizes. Using the criterion proposed by Engelund, most of the available data in the range of sand diameters greater than 0.6 mm consist of bed load measurements. The most reliable equation applicable over a wide range of flow conditions and particle characteristics is the general function of Ackers and White. The Engelund and Hansen method was also very reliable but errors were marginally higher. The Rottner bed load equation can be used with confidence as a total load theory. The behavior of several of the theories which are based on excess shear velocities or excess mobility numbers, together with observations of sediment movement for coarse sediments apparently below the threshold conditions defined by Shields, showed a clear need for further work in this area. Threshold conditions for coarse uniform and nonuniform sediments should be studied. (Lee-ISWS)
W75-11453

CLOSURE CONDITIONS MOUTH OF THE RUSSIAN RIVER,
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 2L.
W75-11454

A GEOMORPHIC SHORELINE INVENTORY WITH MANAGEMENT CONSIDERATIONS FOR WHATCOM COUNTY, WASHINGTON,
Western Washington State Coll, Bellingham. Coastal Studies Group.
For primary bibliographic entry see Field 2L.
W75-11455

RIVER REGIME WITH SPECIAL REFERENCE TO RIVER NILE,
Assiut Univ. (Egypt). Dept. of Hydraulics.
M. B. Khalil.
Journal of Hydraulic Research, Vol 13, No 2, p 149-170. 8 fig, 32 ref.

Descriptors: *Channel morphology, *Alluvial channels, *Sediment transport, *Floods, *Roughness(Hydraulic), Sediment distribution, Boundary processes, Irrigation canals, Gradients(Streams), Gaging stations, Regime.
Identifiers: *Nile River, *Regime theory, Lacey's equations, Egypt.

Regime theory concept of independent adjustment of slope, depth, and bed width was found irrelevent when applied to River Nile. Slope, depth, and width of the river are intercorrelated and are mutually adjusted to attain regime conditions. Two relations were expressed to describe the geometry of River Nile channel, namely silt equations and flow equation. The silt equation relates the discharge, depth, and slope in non-dimensional form to the silt concentration. The flow equation expresses the mean velocity as a function of depth, slope, and the median grain size of the bed. The factor of proportionality of the flow equation, a numerical constant, confirms that of Swiss rivers and is probably a universal constant. In the absence of a theoretical approach to regime of channels in alluvium, the Nile flow and silt equation, based on actual observations, seem to provide a suitable tool for rational calculations of current problems such as resettling the reach of the Main Nile disturbed by the construction of Aswan High dam and in designing of Jonglei canal. (Singh-ISWS)
W75-11464

PHYSICOCHEMICAL PROPERTIES OF DREDGE SPOIL,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11465

SEDIMENT RELATIONS OF SELECTED ALASKAN GLACIER-FED STREAMS,
Alaska Univ., College. Inst. of Water Resources.
G. L. Guymon.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 014, $3.25 in paper copy, $2.25 in microfiche. Report No IWR-51, June, 1974, 17 p. OWRT A-042-ALAS(4).

Descriptors: *Sediment transport, *Sediment yield, *Alaska, Model studies, Equations, Water supply, Glaciology, *Glacial sediments, Suspended load, Suspended solids, Sediment discharge.
Identifiers: Glacial streams.

This research contributes to the general scientific study of sediment processes in Alaska by establishing baseline sediment-related, environmental conditions; initiating support studies related to other glaciology studies; collecting qualitative as well as quantitative knowledge of glacial runoff sediment processes; and providing additional information for water supply studies. Two equations are developed--one models the transport of suspended sediments in glacier-fed streams by calculating suspended sediment concentration in the glaciers melt water outflow; and a second model for estimating regional suspended sediment yield in streams.
W75-11477

GEOCHEMISTRY OF SURFACE SEDIMENTS IN AN ACID STREAM ESTUARY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, and D. T. E. Hunt.
Marine Geology, Vol 18, No 2, p M13-M21, February, 1975. 2 fig, 1 tab, 14 ref.

Descriptors: *Estuary, *Chemical analysis, *Trace elements, Acid streams, Heavy metals, X-ray fluorescence, *Deposition(Sediments, Zinc, Copper, Manganese, Iron, *Path of pollutants.
Identifiers: *North Wales, Transition elements, Bulk sediment.

Selective chemical attack has been used to separate recent surface marine sediments into organic, non-detrital and detrital components, and the concentration of iron, manganese, copper and zinc in each fraction determined. The non-detrital fraction controlled the overall elemental concentrations and relationships apparent in the bulk sediment, particularly in the case of copper, manganese and zinc. Copper was found associated with the organic fraction. The predominant processes of primary deposition are precipitation of hydrated ferric oxide and adsorption of copper and zinc onto this material. (Delfiner-Vanderbilt)
W75-11531

CHEMICAL COMPOSITION OF AEGEAN SEA SEDIMENTS,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
P. A. Smith, and D. S. Cronan.
Marine Geology, Vol 18, No 2, p M7-M11, February, 1975. 1 fig, 2 tab, 6 ref.

Descriptors: *Trace elements, *Heavy metals, *Sediment distribution, Mining, Oceans, Sea water, Aluminum, Magnesium Calcium, Tin, Iron, Manganese, *Pollutant identification.
Identifiers: *Aegean Sea, *Mafic rocks, Mineralization.

The partial composition of 241 sediment samples from the Aegean Sea, analyzed for Ca, Mg, Al, Ti, Fe, Mn, Ni, Cr, Pb, Cu, and Zn, can be largely explained by admixture of terrigenous components of variable composition and biogenic components poor in minor elements. Cr and Pb appear to be enriched owing to the occurrence of mafic rocks and minor Pb mineralization onshore. Variations in elemental abundances within the Aegean Sea can generally be accounted for by differences in depositional environment, except at Sounion where anomalous concentrations of Pb and Zn are probably associated with onshore mining activity. (Litoff-Vanderbilt)
W75-11533

NUTRIENT TRANSPORT IN SURFACE RUNOFF AS INFLUENCED BY SOIL COVER AND SEASONAL PERIODS,
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 5B.
W75-11641

SEDIMENTATION RATES IN A LONG ISLAND MARSH DETERMINED BY PB210 DATING,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 2L.
W75-11643

SOLID PARTICLE SETTLEMENT IN OPEN-CHANNEL FLOW,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-11652

WALL SHEAR MEASUREMENT IN SAND-WATER MIXTURE FLOWS,
Middle East Technical Univ., Ankara (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-11653

SIMULATION OF DISPERSION OF SUSPENDED PARTICLES,
Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-11782

PARAMETERS FOR ESTIMATING ANNUAL RUNOFF AND SOIL LOSS FROM AGRICULTURAL LANDS IN RHODESIA,
Agricultural Engineering Centre, Salisbury (Rhodesia).
For primary bibliographic entry see Field 4A.
W75-11830

2K. Chemical Processes

THE CRYSTAL AND MOLECULAR STRUCTURE OF SELECTED PESTICIDAL WATER POLLUTANTS,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-11351

DETECTOR OF TRACE SUBSTANCE IN WATER,
Shibata Kagaku Kikai Kogyo Kabushiki, Tokoyo (Japan). (assignee).
For primary bibliographic entry see Field 5A.
W75-11388

INTERLABORATORY STUDY OF METHODS FOR CHEMICAL ANALYSIS OF WATER,
National Swedish Environment Protection Board, Stockholm. Research Lab.
For primary bibliographic entry see Field 5A.
W75-11409

SPECTROPHOTOMETRIC DETERMINATION OF FLUORINE IN WATER, (IN RUSSIAN).
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Chelyabinsk (USSR).
For primary bibliographic entry see Field 5A.
W75-11433

SPECTROPHOTOMETRIC DETERMINATION OF SUGARS IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analititicheskoi Khimii.
For primary bibliographic entry see Field 5A.
W75-11437

REGIONAL CHEMISTRY OF GROUNDWATER IN THE WAINWRIGHT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W75-11471

WATER QUALITY REPORT: THE COLUMBIA RIVER BELOW LONGVIEW, WASHINGTON, DECEMBER 1971 - NOVEMBER 1972,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5B.
W75-11472

GYPSUM SOLUBILITY AND SCALING LIMITS IN SALINE WATERS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 3A.
W75-11473

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 1. NORTH ATLANTIC SLOPE BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11479

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11480

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11481

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 6. MISSOURI RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11482

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 7. LOWER MISSISSIPPI RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11483

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 8. WESTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11484

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11485

SELENIUM IN WATERS IN AND ADJACENT TO THE KENDRICK PROJECT, NATRONA COUNTY, WYOMING,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-11492

GROUND-WATER DATA FOR BOLIVAR COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-11496

GROUND-WATER DATA IN THE HARRISBURG - HALSEY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 7C.
W75-11498

QUANTITATIVE INORGANIC ANALYSIS BY GAS CHROMATROGRAPHY, A REVIEW,
Birmingham Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-11528

CHEMICAL COMPOSITION OF AEGEAN SEA SEDIMENTS,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 2J.
W75-11533

ATOMIC-ABSORPTION SPECTROMETRIC DETERMINATION OF CADMIUM, LEAD, AND ZINC IN SALTS OR SALT SOLUTIONS BY HANGING MERCURY DROP ELECTRODEPOSITION AND ATOMIZATION IN A GRAPHITE FURNACE,
Oslo Univ. (Norway). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-11536

DETERMINATION OF THE APPARENT COMPLEXING CAPACITY OF LAKE WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11538

THE DETERMINATION OF TRACES OF LEAD (II) BY SOLID-STATE LUMINESCENCE,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
For primary bibliographic entry see Field 5A.
W75-11541

LOSS OF TRACE ELEMENTS FROM NATURAL WATER DURING STORAGE. I. BEHAVIOR OF 203 HG AND 65 ZN ADDED TO POND WATER,
Tokyo Univ. (Japan). Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 5A.

W75-11543

A COMPARISON OF 15N-DEPLETED AND 15N-ENRICHED FERTILIZERS AS TRACERS,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 3F.
W75-11591

CHLORIDE AND TRITIATED WATER FLOW IN DISTURBED AND UNDISTURBED SOIL CORES,
Kentucky Univ., Lexington. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W75-11594

KINETIC AND EQUILIBRIUM STUDIES OF BORON DESORPTION FROM SOIL,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W75-11600

FORMATION AND COLLAPSE OF SURFACE FILMS,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
J. R. Wheeler.
Limnology and Oceanography, Vol 20, No 3, p 338-342, May 1975. 7 fig, 20 ref.

Descriptors: *Films, *Surface tension, *Air-water interfaces, This films, Pressure, Proteins, Collapse, Sea water, Organic matter, Particle size, Food chain, Laboratory tests, On-site investigations, Bubbles, Lakes, Water.
Identifiers: *Organic films, *Sargasso Sea.

Films that accumulate from lake water, coastal seawater, and Sargasso Sea water with low concentrations of added portein can collapse when subjected to increased surface pressure. Collapse is accompanied by the transformation of some film organic material to particulate material that cannot spread at the interface; these particles are formed from filter-passing organic material previously in the bulk liquid. Film collapse and accompanying particle formation in nature may be a part of a process that, in some areas, removes filter-passing surface-active material from water and precipitates it as particles back into the water column. Such particles tend to sink and could provide particulate food to organisms in the surface waters and perhaps at greater depths. (Lardner-ISWS)
W75-11642

GEOCHEMISTRY AND GENSIS OF FLUORIDE-CONTAINING GROUND WATERS IN INDIA,
Soil Research Lab., Chandigarh (India).
B. K. Handa.
Ground Water, Vol 13, No 3, p 275-281, May-June 1975. 3 fig, 3 tab, 18 ref.

Descriptors: *Geochemistry, *Groundwater, *Fluorides, Mineralogy, Mineral water, Geologic control, Correlation analysis, Thermodynamics, Aqueous solutions, Equilibrium, Saturation, Equations, Ions, Ion exchange, Calcium, Bicarbonates, Nitrates, Evaporation.
Identifiers: *India, *Fluorite, *Apatite, Mineralization, Genesis, Mass law, Integral frequency.

The fluoride content of groundwater in India varies considerably. Among factors which control the concentration of fluoride are the climate of the area and the presence of the accessory minerals, fluorite, and/or apatite in the rock mineral assemblage through which groundwater is circulating. Regional and tectonic factors also play some part in affecting the fluoride concentration of groundwaters. In general, there is a negative correlation between calcium and fluoride concentrations and a positive correlation between fluoride and bicarbonate concentration in groundwaters with high fluoride content. Thermodynamic calculations show that some of these high fluoride groundwaters are supersaturated with respect to fluorite. In water sources from Rajasthan, high fluoride concentrations are generally accompanied by high nitrate concentrations. A solution-evaporation-base exchange hypothesis was put forward to explain the genesis of these groundwaters. In some parts of India, the fluoride content of groundwaters is below 0.5 mg/l, indicating that fluoridation of water supplies may be desirable in these places. (Visocky-ISWS)
W75-11645

STUDIES OF THE AROMATIC COMPOUNDS CONTENT IN SEA WATER BY LOW-TEMPERATURE LUMINESCENT SPECTROSCOPY, (IN RUSSIAN),
Vysshee Inzheneroe Morskoe Uchilishche, Odessa (USSR).
For primary bibliographic entry see Field 5A.
W75-11786

HYDROCHEMICAL AND HYDROBIOLOGICAL PECULIARITIES OF LIMANS IN THE DANUBE-DNIESTER INTERFLUVE, (IN UKRAINIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
I. H. Yenaki, O. I. Ivanov, V. V. Polishchuk, and O. I. Serhyeyev.
Dopov Akad Nauk Ukr RSR Ser B Heol Heofiz Khim Biol, Vol 35, No 9, p 843-847, 1973.

Descriptors: *Hydrobiology, *Benthos, Phytoplankton, Zooplankton, Canals, Marshes, Lagoons.
Identifiers: *Danube-Dniester irrigation canal, *Hydrochemical conditions, Interfluve, *Limans(Interfluve), *Black Sea.

Hydrochemical regime and peculiarities in development of phytoplankton, zooplankton and zoobenthos in the Danube-Dniester interfluve limans was studied during 1966-1972. Hydrochemical regime and development of flora and fauna in these limans, except for the Dniester liman, depend on the regime of the north-western part of the Black Sea, marine and eurihaline freshwater-subsaline water flora and fauna develop in them. Freshwater-subsaline water prevails in the composition of the flora and fauna. The data may be used to predict changes in hydrochemical and hydrobiological regimes of the Danube interfluve limans in connection with long-term plans for the Danube-Dnieper irrigation canal.--Copyright 1975, Biological Abstracts, Inc.
W75-11847

2L. Estuaries

A THREE-DIMENSIONAL THEORY OF COASTAL CURRENTS AND UPWELLING OVER A CONTINENTAL SHELF,
University of East Anglia, Norwich (England). School of Mathematics and Physics.
For primary bibliographic entry see Field 2E.
W75-11450

TURBULENT ENTRAINMENT ACROSS STABLE DENSITY STEP STRUCTURES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W75-11451

THE REDUCTION OF ARTIFICIAL BOUNDARY REFLEXIONS IN NUMERICALLY MODELLED ESTUARIES,
Institute of Oceanographic Sciences, Birkenhead (England).
S. J. Pinless.
The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 255-264, June 1975. 5 fig, 5 ref.

Descriptors: *Estuaries, *Tides, *Numerical analysis, *Tidal effects, Mathematical models, Hydrodynamics, Water level fluctuations, Boundaries(Surfaces), Model studies.
Identifiers: *Boundary conditions, *Thames Estuary(England), Tidal barriers.

The tidal input at the seaward boundary of an estuary model has usually been made to conform to the existing tidal curves. If the model was used to investigate the effects of major physical changes in the estuary, it did not show any effect of these changes on the water levels at the seaward boundary of the model. This difficulty was overcome by locating the model boundary sufficiently far from the sources of any disturbance in the estuary to be unaffected by it. Since observed data were not always available for input at the suitable boundary, a method was developed for computing input for the numerical model from observations at a tide gage within the estuary. The method of seaward extension of a one-dimensional numerical model was described and results from its application to the Thames Estuary were presented. (Adams-ISWS)
W75-11452

CLOSURE CONDITIONS MOUTH OF THE RUSSIAN RIVER,
Army Engineer District, Jacksonville, Fla.
M. P. Rice.
Shore and Beach, Vol 42, No 1, p 15-20, April 1974. 6 fig, 6 ref.

Descriptors: *Rivers, *Inlets(Waterways), *Shores, *Channels, *Tidal streams, *California, Sand bars, Waves(Water), Navigable waters, Jetties, Hydraulics, Littoral drift, Tidal energy.
Identifiers: *Russian River(Calif), *Shorelines, *Waterways, Wave energy, Closure.

Sixty miles north of San Francisco on the north central coast of California the Russian River enters the Pacific Ocean near the small community of Jenner. Since the mid-19th century, there have been attempts to create and maintain a navigable channel between the river and ocean. In 1941, the construction of a single jetty at Jenner was completed. The jetty failed in its original purpose; however, it was realized later that it was of considerable importance in providing a channel for the ingress and egress of fish to and from spawning grounds in the river. For about 2 months (October and November) a year, a sand bar forms across the Russian River mouth allowing little or no water to flow from the river to the sea. In late spring, the mouth is usually open to some degree. However, as wave power increases in early August, the onshore movement of sand increases. The result of this movement is that a sand bar forms across the river mouth and closes it. With the exception of short periods of intermittent breaches in the sand barrier, the mouth usually does not reopen unitl the occurrence of heavy stream flow, usually starting in early December. (Bhowmik-ISWS)
W75-11454

A GEOMORPHIC SHORELINE INVENTORY WITH MANAGEMENT CONSIDERATIONS FOR WHATCOM COUNTY, WASHINGTON,
Western Washington State Coll, Bellingham. Coastal Studies Group.
S. D. Phillabaum, and M. L. Schwartz.
Shore and Beach, Vol 42, No 1, p 21-24, April 1974. 4 fig, 2 ref.

Descriptors: *Geomorphology, *Shores, *Coastal engineering, *Dynamics, *Washington, Beaches, Marine geology, Embankments, Slopes, Sedimentation, Shore protection, Waves(Water), Erosion, Currents(Water), Management, Sand spits.
Identifiers: *Shorelines, *Whatcom County(Wash), Longshore currents.

Washington State's Shoreline Management Act of 1971 required that all counties prepare master plans for the use of their shorelines. These plans were based on information obtained from inventories of several coastal characteristics, including present land use, land ownership, and natural characteristics. This study was an inventory of the geomorphology of the marine shoreline of Whatcom County, and it included a discussion of those aspects of the geomorphology that needed to be considered in managing shoreline use. The inventory, undertaken between March and July 1972, was carried out by traveling along the coast and recording relevant data on an inventory form. Using the data collected, the shoreline was divided into 22 homogeneous segments, and problems which might arise should the morphology and dynamics of the segments be ignored were identified. (Bhowmik-ISWS)
W75-11455

GEOCHEMISTRY OF SURFACE SEDIMENTS IN AN ACID STREAM ESTUARY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 2J.
W75-11531

CHEMICAL COMPOSITION OF AEGEAN SEA SEDIMENTS,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 2J.
W75-11533

THE ECOLOGY OF THE CUMBERLAND ISLAND NATIONAL SEASHORE CAMDEN COUNTY, GEORGIA,
Georgia Univ., Savannah. Marine Extension Center.
H. O. Hillestad, J. R. Bozeman, A. S. Johnson, and C. W. Berisford.
Technical Report No 75-5, May 1975. 299 p, 24 fig, 48 tab, 112 ref, 6 append. SG 04-5-158-4, NPS 1910P21157.

Descriptors: *Georgia, *Atlantic Coastal Plains, Ecology, *Ecological distribution, *Balance of nature, Biology, Geology, *Biogeography, Environment, History, Wildlife, Vegetation, *Seashores, Microbiology, Habitats, Natural resources, Insects, Mammals, Aquatic life, Marine animals, Islands, Soil surveys, National parks.
Identifiers: *Cumberland Island seashore(Geo), Camden County(GA), Terrestrial communities, Fauna surveying, Vegetation sampling.

This study was initiated in 1973 to contribute to the understanding of the ecology of the island. The objectives were to inventory and describe the natural resources within the boundaries of the Cumberland Island National Seashore and to generally describe their functions and relationships. The study area was defined to exclude mainland properties of the National Park Service; it was bounded by the Intracoastal Waterway on the west, the St. Marys River on the south, St. Andrews Sound on the north, and the Atlantic Ocean on the east. Emphasis was on the terrestrial communities of Cumberland (primarily) and Little Cumberland Islands. The offshore and inshore waters were excluded; their structure and function have been summarized previously (Johnson et al. 1975). The approach included detailed sampling, analysis and mapping of vegetation, and extensive surveying of the general fauna with intensive sampling of certain groups. The U.S. Soil Conservation Service cooperated by conducting a soil survey, and other cooperators contributed results of their studies on history, geology, and small mammals. (NOAA)
W75-11546

COASTAL ZONE LEGAL REFERENCES (SELECTED) 1975.
State Univ. of New York, Buffalo. Faculty of Law and Jurisprudence.
NYSG Law Center Reference 1, June 1975, 169 p. Robert I. Reis (editor). NYSSGP-LS-75-014.

Descriptors: *Coasts, *Legal aspects, *Documentation, Water law, Data collections, Regions, Natural resources, Bibliographies.
Identifiers: *Legal references, Reference lists.

This collection of legal references was initiated to give ten Sea Grant Law Fellows a beginning point for their research. It became evident as materials were being collected that a more extensive effort might profit others as well. Such an effort would serve as a basis for reorganizing research patterns to allow substantial additions to the next edition and a finer definition of functional categories. The resulting publication contains an expanded list of legal references applicable to various aspects of the coastal zone. Broad categories include the Make Up of the Coastal Zone, Competing Interests, Impact on Coastal Zone Dynamics, Coastal Zone Regulations, and The Coastal Zone - States. At the back is a section of miscellanea. (NOAA)
W75-11548

PROCEEDINGS OF ALABAMA COASTAL LEADERS CONFERENCE ON COASTAL ZONE MANAGEMENT.
Alabama Development Office, Montgomery. State Planning Div.
For primary bibliographic entry see Field 6E.
W75-11555

A BIBLIOGRAPHY OF BISCAYNE BAY, FLORIDA MONITORING AND RESEARCH PROGRAMS,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 10C.
W75-11557

STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF NORTH CAROLINA, SOUTH OF CAPE LOOKOUT,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2B.
W75-11560

MERCURY CYCLING IN A SMALL HAWAIIAN ESTUARY,
Geological Survey, Honolulu, Hawaii. Water Resources Div.
For primary bibliographic entry see Field 5C.
W75-11563

STATE REGULATION OF COASTAL WATER AREA PRESERVES,
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 6E.
W75-11568

HURRICANE EXPERIENCE LEVELS OF COASTAL COUNTY POPULATIONS - TEXAS TO MAINE,
National Weather Service, Fort Worth, Tex.
For primary bibliographic entry see Field 2B.
W75-11570

AN INVENTORY AND STUDY OF THE VERMILION BAY-ATCHAFALAYA BAY COMPLEX; AREA DESCRIPTION, BIOLOGY, HYDROLOGY AND CHEMISTRY, AND SEDIMENTOLOGY,
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
C. L. Juneau, Jr., and B. Barrett.
Tech Bulletin No 13, April 1975, 158 p. Project No 2-168-R.

Descriptors: *Louisiana, *Gulf Coastal Plain, *Estuarine fisheries, Brackish water, Freshwater, Brackish water fish, Freshwater fish, Fish, Fishing, Fish populations, Zooplankton, Water, Hydrology, Hydrologic data, Water chemistry, Water supply, Flood data, Flood plains, Sedimentology, Lake sediments, Sediments, Temperature, Saline water, Biology, Geology.
Identifiers: *Vermilion Bay, *Vermilion River, *Atchafalaya River, River discharge, Coastal population statistics, Area description.

The VermilionBay-Atchagalaya Bay estuarine complex is a vast open water brackish system whose primary sources of freshwater are the Atchafalaya and Vermilion Rivers. There are approximately 475, 000 surface acres within the system. Vegetation in the complex varies from fresh to brackish, depending on nearness to the mouth of the Atchafalaya River. Vegetation near the River is almost totally fresh while vegetation farther to the west consists mainly to brackish plant species. Also presented are tabular data on river discharge, coastal population statistics, and sources and quantities of induxtrial waste discharged into the system. This report is divided into four phases; Phase I is an area description, Phase II is concerned with the biology of the area, Phase III provides hydrology and water chemistry information, and Phase IV describes the sedimentology. (NOAA)
W75-11571

COASTAL RESOURCE USE: DECISIONS ON PUGET SOUND,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6B.
W75-11573

TRACING OCEAN CURRENTS,
Washington Univ., Seattle. Sea Grant Advisory Service.
For primary bibliographic entry see Field 2E.
W75-11574

THE MANAGEMENT OF LAND AND WATER USE IN THE COASTAL ZONE: A NEW LAW IS ENACTED IN NORTH CAROLINA,
North Carolina Univ., Chapel Hill. School of Law.
For primary bibliographic entry see Field 6E.
W75-11575

SHELL DISEASE IN CRABS AND LOBSTERS FROM NEW YORK BIGHT,
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Lab.
For primary bibliographic entry see Field 5C.
W75-11606

PHYTOPLANKTON DIVERSITY AND CHLOROPHYLL-A IN A POLLUTED ESTUARY,
Montclair State Coll., Upper Montclair, N.J. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-11607

DECOMPOSITION OF UREA ASSOCIATED WITH PHOTOSYNTHESIS OF PHYTOPLANKTON IN COASTAL WATERS,
Nagoya Univ. (Japan). Water Research Lab.

For primary bibliographic entry see Field 5C.
W75-11612

HYDROCARBONS ASSOCIATED WITH SUSPENDED PARTICULATE MATTER IN SAN FRANCISCO BAY WATERS,
Naval Biomedical Research Lab., Oakland, Calif.
For primary bibliographic entry see Field 5A.
W75-11614

THE CASCO BAY OIL SPILL: PROBLEMS OF CLEANUP AND DISPOSAL,
Environmental Protection Agency, Boston, Mass. Div. of Surveillance and Analysis.
For primary bibliographic entry see Field 5G.
W75-11615

FORMATION AND COLLAPSE OF SURFACE FILMS,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
For primary bibliographic entry see Field 2K.
W75-11642

SEDIMENTATION RATES IN A LONG ISLAND MARSH DETERMINED BY PB210 DATING,
Brookhaven National Lab., Upton, N.Y.
T. V. Armentano, and G. M. Woodwell.
Limnology and Oceanography, Vol 20, No 3, p 452-456, May 1975. 2 fig, 1 tab, 14 ref.

Descriptors: *Radioactive dating, *Sedimentation rates, *Lead radioisotopes, *New York, Tidal marshes, Coastal marshes, Deposition(Sediments), Sediments, Organic matter, Measurement, On-site investigations.
Identifiers: *Flax Pond, *Long Island(NY), Spartina alteniflora.

Mean rates of vertical accretion of from 0.47 to 0.63 cm/yr have been determined for the past century from two widely separated sites at Flax Pond, a Spartina alterniflora marsh on the north shore of Long Island. The chemical processes and experimental results from the Pb activity, which was used to date the sediments, was discussed. The rates were equivalent to deposition of 325 to 436 g of dry organic matter per square meter per year or about 146 to 196 g of carbon per square meter per year. Although the two sites differed in salt peat thickness, the basal layer of the peat was deposited about 100 years ago at both. (Lardner-ISWS)
W75-11643

THE GROWTH OF POSIDONIA AND THE URBAN POLLUTION IN THE GULF OF GIENS, (IN FRENCH),
Institut Scientifique et Technique des Peches Maritimes, Nantes (France). Service de Pollution.
For primary bibliographic entry see Field 5C.
W75-11761

VELOCITIES ABOVE ROUGH BED IN OSCILLATORY FLOW,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 8B.
W75-11763

LAND USE AND ENVIRONMENTAL PLANNING: AN APPLICATION IN THE SOUTH CAROLINA COASTAL ZONE,
Battelle-Columbus Labs., Ohio.
For primary bibliographic entry see Field 6G.
W75-11766

DESIGN CRITERIA FOR SINGLE-POINT MOORING TERMINALS,
Shell Internationale Research Maatschappij N.V., The Hague (Netherlands).
For primary bibliographic entry see Field 8C.
W75-11771

INFLUENCE OF CURRENT ON STATISTICAL PROPERTIES OF WAVES,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
C. C. Tung, and N. E. Huang.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 100, No WW4, Proceedings paper No 10922, p 267-278, November 1974. 15 fig, 9 ref.

Descriptors: *Coastal engineering, *Currents(Water), Waves(Water), Analytical techniques, Deep water, Gravity waves, Frequency, Wind velocity, Probability, Equations, *Statistics.
Identifiers: *Inflextion points(Mathematics), Minimax technique, Random processes, Specular reflection, Surface waves, Sea surface, Density function.

The influence of wave-current interactions on various wave statistics is examined analytically. The statistics considered are those of peak magnitude, numbers of zero crossings and maxima, velocities of zeros, specular points, and points of inflexion of sea surface. The sea surface is considered both as a function of space and time. The random wave field is assumed to be unidirectional, zero mean, Gaussian, stationary and homogeneous, and in deep water. The current is considered to be steady in time, nonuniform in space, uniformly distributed in depth, and in or opposite to the direction of the waves. Numerical results are obtained and presented graphically. Results indicate that the interactions phenomena have a relatively mild influence on the maxima of sea surface but the rate of zero crossings and maxima of sea surface, treated as function of space, and the velocity of zeros, specular points, and points of inflextion, are affected by the presence of current to an appreciable extent and can be utilized effectively for current measurements by remote sensing devices. (Bell-Cornell)
W75-11772

WAVE ENERGY TRANSFER MECHANISMS IN WIND-WAVE TUNNELS,
Amoco Production Co., Tulsa, Okla.
For primary bibliographic entry see Field 8B.
W75-11774

OCEAN ENGINEERING--SELECTED REFERENCES,
American Society of Civil Engineers, New York. Task Committee on Selected References of the Technical Council on Ocean Engineering.
For primary bibliographic entry see Field 8B.
W75-11779

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

GYPSUM SOLUBILITY AND SCALING LIMITS IN SALINE WATERS,
California Univ., Los Angeles. School of Engineering and Applied Science.
M. S. Adler, J. Glater, and J. W. McCutchan.
UCLA-ENG-7503, and Water Resources Center Desalination Report No 59, January 1975. 93 p, 15 fig, 11 tab, 35 ref, 6 append.

Descriptors: *Gypsum, *Solubility, *Scaling, *Calcium sulfate, *Saline water, Inorganic compounds, Sulfur compounds, Physical properties, Saturation, Salinity, Water quality, Chemistry, Membrane processes, Sea water, *Desalination, Heat exchangers, Brackish water, Magnesium, Heat transfer.
Identifiers: *Scaling limits, *Calcium sulfate scale, *Scaling thresholds, Modeling solubility, Marshall program, Magnesium augmentation.

Reliable data on gypsum solubility and scaling thresholds are required to establish maximum concentration limits for membrane desalting processes. The solubility of gypsum in natural sea water and agricultural drainage waters was measured at temperatures between 25 and 70 degrees C. Scaling thresholds were evaluated from experimental solubility data by graphical methods. These data were compared with calculated values based on various computation models. Quantitative analysis of water samples provided input data for the computer programs used. A computation scheme based on extended Debye-Huckel theory and experimentally derived constants was used as the basis for this work. The computer program finally developed provides readout of solubilities as well as scaling thresholds for gypsum. The program is practical for engineering use showing a variation of less than 5% from experimentally derived values. The effect of magnesium augmentation on gypsum solubility enhancement was also studied. Magnesium ion is known to significantly increase the solubility of calcium sulfate at elevated temperatures by complexing a portion of dissolved sulfate ion. Routine application of magnesium augmentation to agricultural drainage waters would be limited by economic considerations. (Henley-ISWS)
W75-11473

CALICUM SULFATE SCALING IN REVERSE OSMOSIS (HYPER-FILTRATION) OF BRACKISH WATERS BY HOLLOW-FIBER AND SPIRAL-WOUND MODULES,
Oak Ridge National Lab., Tenn.
R. E. Minturn.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-227 767, $3.75 in paper copy, $2.25 in microfiche. Research and Development Progress Report, Int-OSW-RDPR-73-897, Oct 1973, 163 p, 30 fig, 13 tab, 19 ref, append. DI-14-30-2535.

Descriptors: *Reverse osmosis, *Scaling, Brackish water, *Desalination processes, Filtration, *Membranes, Polarity, *Calcium sulfate, Chemical precipitation, Thermodynamics, Electrolytes, Separation techniques, Waste water treatment.
Identifiers: Hyper-filtration, Polarization, Hollow fiber membranes, Spiral wound membranes.

The objective was to operate hollow-fiber and spiral-wound modules in reverse osmosis of synthetic waters in order to establish a correlation between the practical solubility limits of calcium sulfate as a function of operating conditions and the equilibrium solubility limits that were determined in concurrent work. A subsidiary objective was to organize existing literature data on the free energies of solutions of electrolytes common in natural waters in a manner allowing convenient estimation of osmotic pressures. The results of the experimental program directed to reverse osmosis tests of commercial modules are given, thermodynamic data and procedures for its use are presented and a theoretical discussion of concentration polarization in multicomponent systems is presented.
W75-11505

DESALINATION OF WATER.
Australian Patent 459,735. Issued April 10, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 11, p 1172, April, 1975.

Descriptors: *Patents, *Desalination, Water treatment, Equipment, Saline water, *Waste water treatment, *Evaporation.

A patent was issued for a method of desalination of water. Steps include the feeding of saline water to an evaporator, the feeding of hot waste water to the evaporator, so that the waste water is in a heat exhange relationship with the saline water, the maintaining of a vacuum in the evaporator, and the extraction of condensate from a condenser. The latter is accomplished by means which extract the condensate while maintaining the vacuum in the evaporator through the condenser. The saline water boils in the evaporator and dense saline water is then extracted from the evaporator to maintain the desired level. (Prague-FIRL)
W75-11515

THE APPLICATION OF MEMBRANE PROCESSES IN THE TREATMENT OF SEWAGE,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 5D.
W75-11666

DESALINATION,
J. D. Coogan, D. Hastings, and C. K. Toohey.
Australian Patent 460,623. Issued May 1, 1975. Official Journal of Patents, Trade Marks and Design, Vol 45, No 14, p 1566, May 1, 1975.

Descriptors: *Desalination, *Desalination apparatus, *Condensation, *Patents, Saline water.
Identifiers: Coils.

A method of desalination has been patented. Saline water is driven through each of a series of flat helical coils of tube, connected in tandem by a conduit. The direction of the water flow in each coil is from the outside towards the center. Sufficient heat is applied to the coils to form a water/steam mixture having a velocity in excess of 20 ft/sec at the center of the last coil. The water is separated from the steam, and the steam is condensed. (Murphy-FIRL)
W75-11675

CENTRIFUGAL COMPRESSOR-MELTER FOR DESALINATION OF WATER.
Australian Patent 460,714. Issued May 1, 1975. Official Journal of Patents, Trade Marks and Design, Vol 45, No 14, p 1587, May 1, 1975.

Descriptors: *Desalination apparatus, *Desalination, Potable water, Brackish water, Saline water, Evaporators, *Patents, Crystallization.
Identifiers: *Centrifugal compressor-melter.

A patent has been issued for a device to prepare potable water from brackish- or salt-water. The device consists of a precooler, an evaporator-crystallizer operatively interconnected with the precooler, an ice-brine separating vessel connected with the evaporator-crystallizer, and a compressor, melter-condenser, and auxiliary cooler. The compressor and melter-condenser are combined into a single unit formed by means of a centrifugal fluid vanes compressor. The compression chamber of the fluid vanes compressor is a melting chamber, and the fluid vanes themselves are formed from a mixture of ice particles and a fluid guided by the jets of the fluid vanes compressor rotor. (Murphy-FIRL)
W75-11676

SEA WATER SOFTENING WITH THE LIME-MAGNESIUM CARBONATE (LMC) PROCESS,
Burns and Roe Construction Corp., Fountain Valley, Calif.
For primary bibliographic entry see Field 5F.
W75-11699

SIDROTHERM DESALINATION,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Technology.
For primary bibliographic entry see Field 5D.
W75-11707

3B. Water Yield Improvement

UTILIZATION OF WATER IN A SEMI-ARID REGION,
New Mexico State Univ., Clovis. Plains Branch Agricultural Experiment Station.
For primary bibliographic entry see Field 3F.
W75-11356

INFILTRATION AND RUNOFF FOR SMALL FIELD PLOTS UNDER CONSTANT INTENSITY RAINFALL,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
D. Swartzendruber, and D. Hillel.
Water Resources Research, Vol 11, No 3, p 445-451, June 1975. 6 fig, 1 tab, 8 ref, 1 append.

Descriptors: *Infiltration, *Runoff, *Field crops, *Rainfall, Infiltrometers, Soil surfaces, Rainfall intensity, Simulated rainfall.
Identifiers: Field plots, Infiltration flux time curves, Rehovot loamy sand.

A relatively simple infiltration equation was used to express the family of infiltration flux time curves that occurred under constant rate water application (sprinkling or rain) from the time that excess water appeared at the soil surface. The equation was easily integrated for cumulative water excess as a function of time, which in turn allowed taking into account a simplified static surface storage volume to calculate cumulative water runoff. The runoff equation so obtained was tested by means of a sprinking infiltrometer used on plots of 1 sq m and was found to express with good accuracy the measured cumulative plot runoff as a function of time. The field data, taken with a modified Purdue-Wisconsin sprinkling infiltrometer on Rehovot loamy sand, were then utilized successfully for obtaining the ultimate steady infiltration flux, even when the period of measuring transient runoff was less than 1 hour and the total runoff less than 1 cm of water. The value of steady flux so obtained was in good agreement with that found under the condition of continuous ponding of water on the soil surface. (Roberts-ISWS)
W75-11458

ATMOSPHERIC PHYSICS AND CHEMISTRY LABORATORY: COLLECTED REPRINTS 1973.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2B.
W75-11552

EVAPOTRANSPIRATION AND SOIL MOISTURE IN UPLAND GRASS CATCHMENTS IN THE EASTERN PENNINES,
Leeds Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2D.
W75-11648

PROCEEDINGS OF THE WATER HARVESTING SYMPOSIUM, PHOENIX, ARIZONA, MARCH 26-28, 1974.
Western Regional Research Lab., Berkley, Calif.
USDA Report ARS W-2, February, 1975. 329 p.

Descriptors: *Water harvesting, *Arid climates, *Water yield improvement, *Water supply, *Water storage, *Rainfall-runoff relationships, Water yield, Semiarid climates, Stock water, Water tanks, Surface sealing, Soil compaction, Evaporation control, Storage tanks, Seepage control, Water resources development, Rainfall, Runoff, Computer models, Crop production, *Watersheds(Basins).
Identifiers: Runoff farming, Roaded catchments.

Water harvesting is used to develop local water supplies in remote areas for livestock, wildlife, runoff farming, and domestic use. Various water harvesting and storage techniques along with applications to farming are described in the 30 technical reports herein. The majority of papers discuss results of large scale field experiments, and describe different applications to render the runoff area or storage pond impermeable, including economic aspects and practicability of the treatment. (See W75-11801 thru W75-11829) (Robinett-Arizona)
W75-11800

WATER HARVESTING FOR LIVESTOCK IN WESTERN AUSTRALIA,
Western Australia Dept. of Agriculture, Katanning. Soil Conservation Service.
W. J. Burdass.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 8-26, 4 fig, 1 tab, 1 append, 26 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield, *Water yield improvement, *Water supply, Semiarid climates, Stock water, Surface water, Subsurface waters, Soil types, Streamflow, Saline water, Water tanks, Drainage systems, Flow, Subsurface drainage, Watersheds(Basins), Paving runoff, Channels, Surface sealing, Sealants, Soil sealants, *Australia.
Identifiers: Roaded catchments, Flat batter tanks, Runoff farming.

As groundwater is frequently saline on many farms in Western Australia, agricultural practices often necessitate use of diversions to intercept surface and subsurface flow, or physical or chemical surface treatments to harvest available water. Many farmers rely entirely on harvested water in excavated tanks for cattle. The main methods for water harvesting are contour drains, roaded catchments, and flat batters. Farm catchments deteriorate because of surface weathering and erosion, vegetation growth, and livestock trampling. The roaded catchment is the cheapest of the surface treatments, and is likely to remain the standard surface treatment for water harvest on farms in Western Australia. (See also W75-11800) (Robinett-Arizona)
W75-11801

ENGINEERING ASPECTS OF WATER HARVESTING RESEARCH AT THE UNIVERSITY OF ARIZONA,
Arizona Water Resources Research Center, Tucson.
C. B. Cluff.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkley, California, Western Region, p 27-39, 6 fig, 3 tab, 16 ref.

Descriptors: *Water harvesting, *Drainage systems, *Linings, *Water storage, *Arid climates, Compaction, Soil compaction, Sodium, Gravels, Channels, Channel flow, Flow, Plastics, Asphalt, Water tanks, Semiarid climates, Reservoir storage, Storage tanks, Evaporation control, Seepage control, Surface sealing, Sealants, Soil sealants, Arizona.
Identifiers: Roaded catchments, Runoff farming.

Water harvesting research indicates that the best method of land treatment is determined by the site. Large scale testing of better methods include compacted earth, compacted earth sodium treated,

gravel covered plastic, and asphalt-plastic-asphalt-chipcoated. Percent efficiency for each method was found to range from 30-60 for compacted earth, 40-70 for compacted earth sodium treated, 60-80 for gravel covered plastic, and 85-95 for Asphalt-plastic-asphalt-chipcoated. The compacted earth and compacted earth sodium treated are soil dependent and should not be built where soils are difficult to compact. A gravel covered plastic catchment should be considered where soil is not suitable for a compacted earth or compacted earth sodium treated. The Asphalt-plastic-asphalt-chipcoated system would be used where soil is unsuitable for compacted earth, compacted earth sodium treated and gravel covered plastic, or where high efficiency is required. (See also W75-11800) (Robinett-Arizona)
W75-11802

WATER HARVESTING FOR LIVESTOCK, WILDLIFE, AND DOMESTIC USE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
G. Frasier.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 40-49, 6 fig, 3 tab, 7 ref.

Descriptors: *Water harvesting, *Water storage, *Water requirements, *Cost analysis, Precipitation(Atmospheric), Runoff, Costs, Reservoir storage, Rainfall, Stock water, Water supply, Domestic water, Surface sealing, Sealants, Soil sealants, Rainfall-runoff relationships, *Watersheds(Basins).
Identifiers: Runoff farming.

Water harvesting catchment efficiency is discussed together with the threshold quantity of precipitation required to produce runoff. The efficiency, usually expressed as a percentage of the precipitation as measured by a rain gage, depends on factors such as antecedent soil moisture, storm intensity, and storm duration. Water harvesting costs, a function of unit catchment cost, catchment runoff efficiency, total precipitation and life of the treatment, are tabulated for nine water harvesting treatments. Catchment and storage size relations, which depend on the type of rainfall, are discussed. Suggestions are presented for determination of the relative sizes of catchment and storage, a major problem in designing a useful and economical water harvesting system. (See also W75-11800) (Robinett-Arizona)
W75-11803

WATER DEVELOPMENT IN MANAGEMENT OF LIVESTOCK AND WILDLIFE ON MOUNTAIN WILDLANDS,
Wasatch National Forest, Salt Lake City, Utah. Range, Wildlife and Watershed Management.
G. C. Williams.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, p 50-59, 6 fig, 1 tab, 4 ref.

Descriptors: *History, *Planning, *Water resources, *Water resources development, *Water management(Applied), Livestock, Arid climates, Semiarid climates, Sheep, Cattle, Watersheds(Basins), National forests, Grazing, Range management, Water utilization, Precipitation(Atmospheric), Water law, Water harvesting, Water demand, Surface sealing, Saelants, Soil sealants.

A brief history of livestock development on U.S. western rangelands is given. Water problems associated with livestock management are made more complex by extreme precipitation differences from location to location, for example, a change from a dry valley to a wet mountain side. A natural or developed water supply is one of the most important requirements of grazing a mountain watershed, and intensive management is necessary. The critical need for good management is planning development techniques is stressed. (See also W75-11800) (Robinett-Arizona)
W75-11804

BITUMEN, OIL, AND CLAY SURFACES ON A DEEP SAND TO INCREASE RUNOFF FROM CATCHMENTS FOR EXCAVATED TANKS IN WESTERN AUSTRALIA,
Western Australia Dept. of Agriculture, South Perth. Soils Div.
I. A. F. Laing, and A. L. Prout.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 63-75, 2 fig, 6 tab, 6 ref.

Descriptors: *Stock water, *Water supply, *Water yield improvement, *Water harvesting, *Soil sealants, Storage tanks, Water storage, Soil types, Sands, Semiarid climates, Precipitation(Atmospheric), Surface runoff, Surface sealing, Infiltration, Water proofing, Coatings, Sealants, Soil treatment, *Australia.
Identifiers: Western Australia, Runoff farming.

In the southern coastal areas of Western Australia groundwater is rarely potable and stock water supplies rely on runoff from pastured areas or roaded catchments. Experimentation on runoff improvement was done with eight different soil treatments using bitumen, oil, and clay: Data showed that oil primed plots were significantly better than bitumen, and oil and bitumen together were better than clay treatments. Clay treated surfaces were least affected by stock trampling. Runoff from fuel oil treated catchments was found apparently safe for livestock use. Considerations of cost and runoff percentages show the clay catchments to be most practical. (See also W75-11800) (Robinett-Arizona)
W75-11805

SOIL TREATMENT WITH SILICONES FOR WATER HARVESTING,
Dow Corning Corp., Midland, Mich.
E. P. Plueddemann.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 76-83, 1 fig, 3 tab, 4 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield improvement, *Surface sealing, *Soil sealants, Water yield, Coatings, Water supply, Semiarid climates, Soil types, Water tanks, Sealants, Rain water, Runoff, Sands, Rainfall-runoff relationships, Water storage, Rainfall, Polymers, Waterproofing, Costs.
Identifiers: Runoff farming.

Effective treatment of a sandy soil was done with an aqueous spray containing a polymer latex and water repellent. The polymer latex bound the soil and the water repellent caused water to run off. An acrylic and a styrene-butadiene resin looked most promising among commercial polymers tested. A sodium methylsiliconate and a silicone emulsion were effective as water repellents, but the emulsion gave better results and was easier to use. A mixture of styrene-butadiene resin latex and silicone emulsion is stable at 50% solids, and can be diluted with water to about 3% solids for soil application. (See also W75-11800) (Robinett-Arizona)
W75-11806

CHEMICAL WATER HARVESTING,
DeJong and Associates, Tucson, Ariz.
R. L. A. DeJong, and T. J. Wallace.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 84-92, 3 fig, 1 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Soil sealants, *Surface sealing, *Waterproofing, Water yield, Rainfall-runoff relationships, Runoff, Sealants, Soil surfaces, Seepage control, Arizona, Rainfall, Soil chemical properties, Soil physics, Coatings, Costs.
Identifiers: Runoff farming.

The primary chemical used was F125, a soil sealant manufactured by Trans-continental Research and Development Corporation, Tucson, Arizona. The effect of formula F125 on 13 soil properties was studied along with 12 technical properties of chemical F125. At the end of testing there was no recorded loss of waterproofing, nor any erosion of soil. The water sealing function of the chemical was 100 percent. Using F125 at a ratio of 44 to 1 and application rate of 1 gallon per square yard, cost per acre was calculated to be 1,087.80 dollars. Construction involved in site preparation and application of the chemicals require work of only average complexity and sophistication, which enhances the possibilities of application in remote areas. (See also W75-11800) (Robinett-Arizona)
W75-11807

PERFORMANCE AND DURABILITY OF SHEET METAL, BUTYL RUBBER, ASPHALT ROOFING AND BENTONITE FOR HARVESTING PRECIPITATION,
Agricultural Research Service, Akron, Colo. Central Great Plains Field Station.
R. H. Mickelson.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 93-102, 3 fig, 2 tab, 11 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield improvement, *Rainfall-runoff relationships, *Linings, Water yield, Water supply, Surface sealing, Sealants, Soil sealants, Rain water, Runoff, Rain-fall, Rubber elastomers, Coatings, *Asphalt, Soil asphalt, *Bentonite, Colorado, Regression analysis, *Rubber.
Identifiers: Runoff farming, Akron(Colo).

Climate, soils, and topography are important factors to consider when selecting materials for harvesting water in any given area. Climate is the most critical, because materials used on the catchment area must withstand annual variations in climate conditions. Asphalt compounds with and without protective coatings have been used more successfully in the arid Southwestern United States than in the Semiarid west, central and northern Great Plains regions, due to extreme temperature variations in the Great Plains which accellerate deterioration. Five experimental harvesting techniques using sheet metal, butyl rubber, asphalt roofing, soil bentonite mixture and native grass were tested. Average annual volume of water harvested from sheet metal butyl rubber, and asphalt roofing was about 50-55 percent of rainfall whereas the bentonite plot was 19 percent and the check plot was 5 percent. Regression analysis was made on rainfall-runoff relationships. (See also W75-11800) (Robinett-Arizona)
W75-11808

WATER HARVESTING CATCHMENTS ON INDIAN LANDS IN THE SOUTHWEST,
Bureau of Indian Affairs, Phoenix, Ariz.
J. V. Chiarella, and W. H. Beck.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 104-114, 1 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield improvement, *Performance, *Stock water, Water yield, Water supply, Surface sealing, Sealants, Soil sealants, Rainfall, Runoff, Rainfall-runoff relationships, Linings, Rubber, Elastomers, Coatings, Asphalt, *Arizona, Maintenance, Water storage, Soil compaction, Seepage, Indian reservations, Livestock, Southwest US, Watersheds(Basins).
Identifiers: Phoenix(Ariz), Runoff farming.

Performance of thirty-two catchments built in the Phoenix, Arizona area is discussed. General procedures for construction of these catchments is presented, explaining techniques for removing the vegetation, smoothing and treating the ground with a soil sterilant, and building the catchment. In most instances, success with the catchments on Indian lands was limited, the blame being placed on some technicians reluctant to accept the practicability of the basins. Maintenance on catchments was often negligible unless actually done by the tribe. (See also W75-11800) (Robinett-Arizona)
W75-11809

DESIGN AND CONSTRUCTION OF ROADED CATCHMENTS,
Western Australia Dept. of Agriculture, Moora. Soil Conservation Service.
J. L. Frith.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, US Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 122-127, 4 fig, 7 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield, *Water yield improvement, *Water supply, Semiarid climates, Water tanks, Drainage systems, Flow, Surface sealing, Runoff, Surface sealing, Soil types, Rainfall-runoff relationships, Rainfall, Soil surfaces, Soil compaction, Clays, *Australia.
Identifiers: *Roaded catchments, Runoff farming, Western Australia.

Roaded catchments in Western Australia are areas of formed, compacted, parallel ridges of earth made in similar fashion to earth roads. Sites should contain clay soil or subsoil and have a surface slope that allows catchment drains to be alined on correct grades and should not be more than 400 meters above dam. Individual roads vary from 5 to 12 meters wide and 50 to 300 meters long. The depth to clay subsoil and selection of road width and side slope, which will expose adequate amounts of clay to cover the catchment, are very important factors. Catchment surface slope is progressively decreased whereas road side slopes are made as steep as possible. Compaction and smoothing produced by rolling during construction impede weed growth and increase runoff and durability. The period during which catchments can be constructed in Western Australia is restricted to Autumn and spring when moisture conditions are optimum for soil compaction. (See also W75-11800) (Robinett-Arizona)
W75-11810

DESERT STRIP FARMING--COMPUTER SIMULATION OF AN ANCIENT WATER HARVESTING TECHNIQUE,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
G. C. A. Morin, and W. G. Matlock.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 141-150, 3 fig, 4 tab, 7 ref.

Descriptors: *Water harvesting, *Water yield, *Strip cropping, *Crop response, *Soil moisture, Runoff, Rainfall-runoff relationships, *Arizona, Rainfall, Water yield improvement, Computer models, Mathematical models, Sorghum, Crop production, Semiarid climates, Dry farming, Analytical techniques.
Identifiers: Runoff farming, Tucson(Ariz), Desert strip farming.

A field study of grain sorghum was made in southern Arizona, using only direct precipitation and precipitation from adjacent untreated water collection areas. A mathematical model of a crop growing under desert strip farming conditions was solved and results compared to actual yields. Rainfall data for 1900-1972 were used in the model to predict long term success of desert strip farming. Model predictions for crop yield were slightly low when soil moisture conditions were good and high when moisture conditions were poor. Data for the Tucson Basin indicate that for a collector area to farmed area ratio of 12 there will be significant production of short-season grain sorghum in 4 out of 5 years with field data supporting the validity of the model. The model also indicates that distribution of rainfall in time and space may be more important than total rainfall. *See also W75-11800) (Robinett-Arizona)
W75-11812

A COMPUTER MODEL FOR OPTIMIZING DESIGN OF IMPROVED CATCHMENT,
Western Australia Dept. of Agriculture, Moora. Soil Conservation Service.
J. L. Frith, R. A. Nulsen, and H. I. Nicol.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 151-157, 3 fig, 1 tab, 5 ref.

Descriptors: *Water harvesting, *Arid climates, *Water supply, *Water storage, Systems analysis, Stock water, Water tanks, Rainfall-runoff relationships, *Australia, Runoff, Rainfall, Ponds, Simulation analysis, Mathematical models, Analytical techniques, Sheep, Watersheds(Basins), *Computer models.
Identifiers: Runoff farming, Western Australia.

In western Australia, 60 years of daily rainfall records were used to compute daily additions to storage. Combinations of catchment area, dam capacity, and sheep flock size were set up and the application of isocosts to isoquants to determine least cost combinations of dam capacity and catchment area for 1,000 sheep was applied. The value of 7.5 millimeters was chosen to represent the threshold of well-constructed, clay-covered roaded catchments. Results indicate that in the region of Jerramungup, it is likely that sheep could be supplied with water from dams and roaded catchments for about 0.65 dollars per sheep. (See also W75-11800) (Robinett-Arizona)
W75-11813

SEALING LEAKING EXCAVATED TANKS ON FARMS IN WESTERN AUSTRALIA,
Western Australia Dept. of Agriculture, South Perth. Soils Div.
I. A. F. Laing.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, p 159-174, 1 fig, 7 tab, 12 ref, 1 append.

Descriptors: *Water harvesting, *Arid climates, *Water supply, *Water tanks, *Soil sealants, Water yield, Water yield improvement, Semiarid climates, Soil types, Ponds, Watersheds(Basins), Surface sealing, Sealants, Runoff, Water storage, Clays, Sodium, Seepage, Rainfall, *Australia, Leakage, Bentonite.
Identifiers: Runoff farming Western Australia.

Runoff seldom occurs during summer and autumn months, and tanks must hold water for at least 200 days. Farm water supply surveys show that in most districts less than 5 percent of all excavated tanks leak, whereas in some districts over 40 percent leak. Sealing a large tank is cheaper per cubic meter than for a small tank and the following treatments were used: Rivaseal (a thin polyester film and fiberglass mat laminated together), polyethylene sheeting, bentonite, and sodium tripolyphosphate. Maximum tolerable seepage loss was 600 millimeters per 200 days. From water loss data and experience in installation, the Rivaseal offered best prospects for seepage control, although it was most expensive. (See also W75-11800) (Robinett-Arizona)
W75-11814

STORAGE SYSTEMS FOR HARVESTED WATER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
A. R. Dedrick.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 175-191, 3 fig, 39 ref.

Descriptors: *Water harvesting, *Water supply, *Water tanks, *Water storage, *Seepage control, Water yield, Water yield improvement, Soil types, Ponds, Surface sealing, Sealants, Soil sealants, Runoff, Soil surfaces, Soil compaction, Rainfall, Bentonite, Asphalt, Coatings, Elastomers, Rubber, Linings, Storage tanks.
Identifiers: Runoff farming.

Requirements of the water storage system, general storage considerations, and various modes of water storage are discussed along with specific materials used to produce efficient water storage systems. The best mode or material is dependent on local conditions such as: soils, accessibility regarding personnel, equipment, and materials, availabaility of materials, costs, and system life requirement. Storage requirements must be balanced against quantity of precipitation and reliability of receiving this precipitation. Thirteen different methods of sealing ponds are described; Compacted earth, bentonite, chemical additives, chemical sealants, membrane and film, prefabricated asphaltic plank, hot applied asphaltic membrane, reinforced asphaltic membrane, plastic film, synthetic rubber, hard surface linings, storage bags, and storage tanks. (See also W75-11800) (Robinett-Arizona)
W75-11815

EVAPORATION SUPPRESSION FOR CONSERVING WATER SUPPLIES,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
K. R. Cooley.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, p 192-200, 2 tab, 18 ref.

Descriptors: *Water harvesting, *Arid climates, *Evaporation control, *Reservoir evaporation, *Water conservation, *Reflectance, Water yield, Water yield improvement, Water supply, Semiarid climates, Water tanks, Ponds, Water storage, Rainfall, Water properties, Albedo, Radiation, Energy transfer, Costs.
Identifiers: Water coloring, Shading, Wind baffles, Rafts.

A large increase in reflectance by making water surfaces as light colored as possible can significantly reduce evaporation. Four main categories of energy-reducing treatments are discussed: coloring the water, floating materials on the water, shading the water, and wind baffles. Continous wax, polystyrene rafts, and butyl rubber are the most readily available and practical of the lower cost materials, although wind protection may be necessary in some cases. Cost of water saved com-

pared favorably with costs of alternative sources. (See also W75-11800) (Robinett-Arizona)
W75-11816

THE DESIGN OF ROADED CATCHMENTS FOR MAXIMUM RUNOFF,
Western Australia Univ., Nedlands. Dept. of Civil Engineering.
M. Hollick.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 201-220, 17 fig, 2 tab, 7 ref.

Descriptors: *Water harvesting, *Arid climates, *Water yield improvement, *Water supply, *Rainfall-runoff relationships, Water yield, Semiarid climates, Soil types, Surface sealing, Soil sealants, Sealants, Runoff, Clays, Seepage, Rainfall, Australia, Costs, Computer, Computer models, Mathematical models, Channels, Analytical techniques.
Identifiers: *Roaded catchments, Runoff farming, Western Australia.

Development of a method for calculating maximum nonerosive gradients for channels, is presented, as well as computer model studies to find the best catchment shape. Results in Western Australia show that: (1) The best width for plane-sided roads varies from about 1 to 6 meters. (2) Corrugations, or miniroads, on sides of roads are valuable, and in this case, optimum width ranges from about 6 meters to the limits of economical construction. (3) Roads should never by shorter than the length tat gives a square catchment layout, and in many cases should be longer. The best prospects for improving the performance of roaded catchments seems to be in the development of techniques for forming miniroads which increase runoff and give a wide range of acceptable widths to allow the use of standard roadmaking equipment and to enable a subsoil blanket to be obtained. (See also W75-11800) (Robinett-Arizona)
W75-11817

WATER HARVESTING BY RUNOFF INDUCEMENT FOR IRRIGATION OF AN ALMOND ORCHARD IN A SEMIARID CLIMATE,
United Nations Development Program, New Delhi (India).
E. Rawitz, and D. Hillel.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 223-232, 9 fig, 1 tab, 10 ref.

Descriptors: *Water harvesting, *Sermiarid climates, *Water yield improvement, *Soil sealants, *Crop production, Water yield, Water supply, Surface sealing, Sealants, Runoff, Rainfall, Rainfall-runoff relationships, Sodium, Soil compaction, Aspalt, Crop response, Dry farming, Soil moisture, Water conservation, Soil surfaces.
Identifiers: Runoff farming, *Israel(Negev).

Techniques used to increase runoff include land smoothing and compaction, formation of a sodic crust, and the spraying of asphaltic materials. Crop production and soil moisture measurements show that runoff-farming is possible in this 200 to 250 millimeter(mm) rainfall area of the northern Negev in Israel. Area ratios between contributing and receiving areas of 3:1 to 6:1 provide seasonal accretion in a deep soil profile of well over 600 mm. (See also W75-11800) (Robinett-Arizona)
W75-11818

FIELD EVALUATION OF MICROWATERSHED AND VERTICAL MULCH SYSTEMS,
Agricultural Research Service, Fort Collins, Colo.
M. L. Fairbourn.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 233-243, 8 fig, 3 tab, 6 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Mulching, *Water conservation, *Soil moisture, Colorado, Runoff, Water yield, Soil sealants, Soil types, Surface sealing, Runoff, Rainfall, Rainfall-runoff relationships, crop response, Crop production, Dry farming, Soil-water-plant relationships, Soil surfaces, *Great Plains, Watersheds(Basins).
Identifiers: Runoff farming.

An experiment on the semiarid Great Plains using 3 main treatments, (vertical mulched, non-mulched, and flat surface microwatershed), is described for improvement of water use efficiency by crops. Water infiltrated readily on the vertical mulched microwatershed, and the treated surface soil stayed dry causing a marked increase in soil water storage. Water saved on vertical mulched treatment appeared to cause an increase in yields ranging from 37 to 150 percent compared with the control treatment. A microwatershed system with a contributing slope to crop area ratio of 3 to 1 appeared to be suitable for the soil type and precipitation at Akron, Colorado. (See also W75-11800) (Robinett-Arizona)
W75-11819

AN ANALYSIS OF THE EFFICIENCY OF MICROWATERSHED SYSTEMS,
Agricultural Research Service, Fort Collins, Colo.
H. R. Gardner.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 244-250, 4 fig, 1 tab, 3 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Mulching, *Water conservation, *Evaporation control, Colorado, Runoff, Rainfall, Water yield, Soil moisture, Soil water movement, Evaporation, Infiltration, Soil surfaces, Soil water, Plant growth, Soil-water-plant relationships, Great Plains, Watersheds(Basins).
Identifiers: Runoff farming.

A vertical mulched slot placed at the bottom of a watershed slope, caused deeper penetration of water and reduction of evaporation at the Central Great Plains Field Station at Akron, Colorado. Cumulative evaporation was predicated and also determined by initial and final water contents in the soil profile, showing a decrease in evaporative loss of 2.9 centimeters due to the mulch system. There appears to be a potential for decreasing evaporation up to 50 percent. (See also W75-11800) (Robinett-Arizona)
W75-11820

USING PARAFFIN AND POLYTHYLENE TO HARVEST WATER FOR GROWING SHRUBS,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
E. F. Aldon, and H. W. Springfield.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultral Research Service, Berkeley, California, Western Region, p 251-257, 3 fig, 1 tab, 8 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Semiarid climates, Soil sealants, Plant growth, Runoff, Rfall, Rainfall-runoff relationships, Water yield, Surface sealing, Sealants, *Plastics, Soil moisture, Soil-water-plant relationships, Plant physiology, Soil temperature, New Mexico.
Identifiers: Runoff farming, *Wax.

The experiment, conducted at Santa Fe, New Mexico, consisted of installing sheets (9 square feet), of black polyethylene around the stem of the plant, or waterproofing the soil around the plant using paraffin wax. Seventy five days after planting, shrubs grown in plots treated with polyethylene were largest, while those in untreated plots were smallest. Soil temperatures 1 inch deep were higher under paraffin than under polyethylene, and soil moisture was higher under both the paraffin and polyethylene than the untreated plots. A half-pound of ground paraffin per square foot harvested as much water as higher rates of paraffin. (See also W75-11800) (Robinett-Arizona)
W75-11821

PRECIPITATION ENTRAPMENT FOR EVAPORATION SUPPRESSION,
Agricultural Research Service, Orono, Maine. Soil, Water and Air Sciences.
J. R. Hoover.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, P 259-268, 4 fig, 6 tab, 18 ref.

Descriptors: *Crop production, *Water harvesting, *Evaporation control, *Water yield improvement, *Soil moisture, Rainfall, Water conservation, Arid climates, Water yield, Water supply, Semiarid climates, Soil sealants, Plant growth, Runoff, Rainfallrunoff relationships, Surface sealing, Sealants, Plastics, Soil-water-plant relationships, Evaporation, Crop response, Crop production, South Dakota, Soil profiles, Soil stabilization.
Identifiers: Runoff farming, Dust control agents, Soil stabilizers.

Soil moisture storage can be increased by precipitation runoff inducement to a concentration level where the rainfall is conducted to a point deep in the soil where it can infiltrate the experiment objective was to determine the amount of moisture from both small and large storms that could be saved by entrapment in the soil profile and used for plant production. Deep placement of precipitation was effective when coupled with a plastic surface sealant while the chemical DCA-70 soil stabilizer and dust control agent was not consistently effective for inducing runoff or for evaporation suppression. (See also W75-11800) (Robinett-Arizona)
W75-11822

CROP PRODUCTION BY WATER HARVESTING,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
D. D. Fangmeier.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research service, Berkeley, California, Western Region, p 269-276, 7 tab, 2 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Arid climates, *Water supply, *Crop production, Runoff, Rainfall, Rainfall-runoff relationships, Water yield, Semiarid climates, Soil sealants, Plant growth, Surface sealing, Sealants, Plastics, Soil-water-plant relationships, Crop response, *Arizona, Soil moisture, Water requirements.
Identifiers: Runoff farming.

The feasibility of using runoff water for crop production in southeastern Arizona without water storage facilities is studied. Plots were planted with grain sorghum and four water treatments were used providing each basin with 3, 4, 5, or 6 times the measured rainfall. Planting on the flat or in small furrows appears preferable to deep furrows or beds, and soil leveling can be very critical as low spots will receive more water and give more

growth. Yield data for 4 years indicate that it is possible to produce a crop in this area using water harvesting, however, dry years or years with above-average late-season precipitation can result in little or no production. (See also W75-11800) (Robinett-Arizona)
W75-11823

RUNOFF UTILIZATION FOR GRAIN PRODUCTION,
Agricultural Research Service, Bushland, Tex. Southwestern Great Plains Research Center.
O. R. Jones, and V. L. Hauser.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 277-283, 4 fig, 1 tab, 10 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Crop production, *Bench leveling, *Contour farming, Terracing, Erosion control, Sorghum, Runoff, Water yield, Rainfall, Rainfall-runoff relationships, Semiarid climates, Plant growth, Sail-Water-Plant relationships, Crop response, *Texas, Soil moisture, Land forming, Soil conservation.
Identifiers: Runoff farming, Conservation bench terraces.

Results are reported of 14 years of research at Bushland, Texas, on conservation bench terraces and bench leveling, and comparison of yields with those from other cropping systems to determine effects of runoff on grain yields. Bench leveling to prevent runoff increased sorghum yields 43%, and conservation bench terraces increased yields 80% over yields obtained on sloping plots that had runoff. Bench leveling had greater farm production than conservation bench terraces because all the land area was cropped continuously but also had an increased probability of poor yields. Only one-third of the conservation bench terraces area needs to be leveled whereas all land area is leveled for bench leveling. (See also W75-11800) (Robinett-Arizona)
W75-11824

WATER HARVESTING FOR BARLEY IN A 30-CM WINTER RAINFALL AREA,
California Univ., Riverside.
R. E. Luebs, and A. E. Laag.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 284-291, 3 tab, 8 ref.

Descriptors: *Water harvesting, *Rainfall-runoff relationships, *Water yield improvement, *Crop production, *Water supply, Runoff, Rainfall, Water yield, Soil moisture, Soil-water-plant relationships, Plant growth, Water requirements, Plastics, Soil sealants, Surface sealing, Sealants, California, *Barley.
Identifiers: Runoff farming.

In an experimental area with a 1:1 ratio of polyethylene covered runoff surface to collection area, an annual average of 62% of runoff was retained on cropped areas which increased available soil water throughout the growing season. Barley grain production was increased significantly in 1 year of 3 and production with water harvesting was greater 2 or 3 years when compared with the fallow-crop system, which used the same land area. (See also W75-11800) (Robinett-Arizona)
W75-11825

OPPORTUNITY FOR HARVESTING WATER FROM AND ALONG HIGHWAYS IN RANGELAND AREAS OF WYOMING,
Agricultural Research Service, Fort Collins, Colo.
C. E. Evans, D. A. Woolhiser, and F. Rauzi.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 293-301, 5 fig, 6 ref.

Descriptors: *Water harvesting, *Rainfall-runoff relationships, *Water yield improvement, *Crop production, *Computer models, Runoff, Rainfall, Water yield, Soil moisture, Plant growth, Mathematical models, Analytical techniques, *Wyoming, Highways, Land management.
Identifiers: Runoff farming.

Forage yield observations along a particular highway showed substantially greater production than was observed from adjacent native rangelands. Areas along the highway were harvested with yield estimates ranging from 3 to 8 tons of quality has per mile. Herbage yields could probably be increased susbstanitally with fertilization, land leveling and shaping, better adapted plant species, and improved management. (See also W75-11800) (Robinett-Arizona)
W75-11826

ESTABLISHING WINDBREAKS IN SEMIARID AREAS BY ALTERING THE MICROCLIMATE OR SUPPLYING ADDITIONAL WATER,
Agricultural Research Service, Manhattan, Kans.
J. D. Dickerson, and N. P. Woodruff.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agricilture, Agricultural Research Service, Berkeley, California, Western Region, p 302-309, 3 tab, 36 ref.

Descriptors: *Microclimatology, *Water harvesting, *Water yield improvement, *Surface sealing, *Plant growth, Runoff, Rainfall, Rainfall-runoff relationships, Soil sealants, Sealants, Water requirements, Kansas, Solar stills, Mulching, *Scotch pine trees, Wind breaks, *Juniper trees.
Identifiers: Runoff farming, Drip irrigation, Recedar, Shading.

Seven methods were used to supply additional water or alter the microclimate of redcedar (Juniperus virginiana) and Scotch pine (Pinus sylvestris) trees to induce faster growth and higher survival rates. Two water harvest treatments for redcedars produced 32% and 31% more total growth than did a control, and drip irrigation and snow-fence-protected treatments produced 25% and 24% more total growth, respectively. Shaded treatment did not increase growth but resulted in 100% survival compared with 70% for the control. Scotch pines tended to have better survival and total growth in a protected or shaded environment. (See also W75-11800) (Robinett-Arizona)
W75-11827

MULTIPURPOSE SALT TREATED WATER HARVESTING SYSTEM,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
G. R. Dutt, and T. W. McCreary.
In: Water Harvesting Symposium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 310-314, 1 fig, 4 tab.

Descriptors: *Water harvesting, *Water yield improvement, *Semiarid climates, *Water supply, *Water conservation, Runoff, Rainfall, Rainfall-runoff relationships, Water yield, Arizona, Soil-water-plant relationships, Plant growth, Crop production, Crop response, Soil moisture, Soil sealants, Surface sealing, Sealants, Sodium chloride, Soil compaction, Seepage, Water tanks, Ponds, Water storage, Evaporation control.
Identifiers: Runoff farming, Tucson(Ariz), Rafts, *Grapes.

The requirements of this system are to collect water for use inside or outside the system, increase the desired production of the land within the system, and provide an esthetically pleasing environment. A salt treated catchment planted with grape vines, with a storage pond for drought periods is discussed. Since December 1971, the tank, which receives about 52% of the rainfall over the catchment has never been dry. Grape vines receive water from the pond during dry periods and have shown good growth. The salt content of the water in the tank at different dates shows that after initial establishment the salt content declines, indicating added chloride is remaining on the catchment. (See also W75-11800) (Robinett-Arizona)
W75-11828

DIFFERENT SOIL TREATMENTS FOR HARVESTING WATER FOR RADISH PRODUCTION IN THE MEXICO VALLEY,
Escuela Nacional de Agricultura, Chapingo (Mexico). Dept. of Soils.
M. G. Anaya, and J. S. Tovar.
In: Water Harvesting Sympósium, March 26-28, 1974, Phoenix, Arizona, U.S. Department of Agriculture, Agricultural Research Service, Berkeley, California, Western Region, p 315-320, 3 tab, 8 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Surface sealing, *Crop production, *Water supply, Runoff, Rainfall, Rainfall-runoff relationships, Water yield, Soil-water-plant relationships, Plant growth, Sealants, Soil sealants, Crop response, Soil moisture, Soil compaction, Plastics, *Mexico, *Soil treatment.
Identifiers: Runoff farming, Straw, *Radishes.

Five treatments were applied on runoff surfaces: Polyethylene, straw, compacted-earth, compacted-earth-diesel-treated 250 ml per sq m, and compacted-earth-diesel-treated 125 ml per sq m. No significant differences in radish yields were obtained with the 5 treatments and therefore the cheapest of these methods; compacted-earth or compacted-earth-diesel-treated is recommended. The more surface used for runoff, the higher the production of radish obtained on the 3 levels studied. (See also W75-11800) (Robinett-Arizona)
W75-11829

3C. Use Of Water Of Impaired Quality

DEVELOPMENT OF SALINITY CONTROL TECHNOLOGY IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W75-11585

PREDICTING EXCHANGEABLE SODIUM RATIOS IN IRRIGATED TROPICAL VERTISOLS,
Hawaii Inst. of Geophysics, Honolulu.
S. Sinanuwong, and S. A. El-Swaify.
Soil Science Society of America Proceedings, Vol 38, No 5, p 732-737, September-October, 1974. 7 fig, 7 tab, 12 ref.

Descriptors: *Sodium, *Hawaii, Soil properties, Soil chemical properties, Soil properties, Soil chemistry, Soil tests, Forecasting.
Identifiers: Sodium exchange, Sodium adsorption, Vertisols.

Batch equilibrium studies were used to investigate Na divalent exchange and to derive Gapon constants for three Hawaii Vertisols. Obtained regression coefficient values indicated that a linear relationship exists between exchangeable sodium ratios (ESR) and sodium adsorption ratios (SAR) for tropical Vertisols. ESR values obtained for two

of the soils were slightly lower than the values predicted by Bower's equation and higher than those predicted by the U.S. Salinity Laboratory's equation. ESR values obtained for the third soil were lower than those predicted by either equation. Generally, the higher preference of surface than of subsurface horizons for Na was confirmed. Prevailing electrolyte concentration levels were found more important than any other experimental variable in affecting the precision of ESR estimates for a given SAR. Although ESR values were generally higher at 0.1N than at 0.01N, the valence-dilution effect was reversed for the surface horizon of one Vertisol during Mg-Na exchange. While little difference was noted between Ca-Na and Mg-Na exchange in one of the soils, in the other two significantly smaller ESR values were obtained for the first than for the second reaction. An unexpected type of hysteresis effect was noted, whereby divalent-soils exhibited greater preference for Na than did Na-soils. Possible reasons for this effect are discussed. (Skogerboe-Colorado State)
W75-11595

RICE RESPONSE TO NITROGEN AND PHOSPHORUS IN FLOODED AND NON-FLOODED SOILS,
National Fertilizer Development Center, Muscle Shoals, Ala.
For primary bibliographic entry see Field 3F.
W75-11597

COMPARATIVE EFFICIENCY OF SOLUBLE AND CONTROLLED-RELEASE SULFUR-COATED UREA NITROGEN FOR CORN IN TROPICS,
University of the West Indies, St. Augustine (Trinidad).
For primary bibliographic entry see Field 3F.
W75-11601

RELATION BETWEEN NITRATE ABSORPTION AND WATER TRANSPIRATION BY CORN,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W75-11602

SALT TOLERANCE OF MEXICAN WHEAT: II. RELATION TO VARIABLE SODIUM CHLORIDE AND LENGTH OF GROWING SEASON,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
C. T. Bernal, F. T. Bingham, and J. Oertli.
Soil Science Society of America Proceedings, Vol 38, No 5, p 777-779, September-October, 1974. 7 fig, 2 tab, 15 ref.

Descriptors: *Wheat, Crop response, Crop production, Germination, *Salinity, *Salt tolerance, Sodium chloride.
Identifiers: *Mexican wheat.

Germination, seedling growth, and grain production of four short-season, one intermediate-season, and three long-season varieties of Mexican wheat were studied in relation to variable NaCl salinity. Germination counts after 7 days exposure to NaCl solutions in petri dishes revealed that the wheats as a group are relatively tolerant, germinating freely in the presence of -16 to -20-atm osmotic potential. Tolerance at germination was not associated with any obvious properties such as length of growing season or seed hardness. The eight wheat varieties were grown from seedling stage to maturity in sand cultures with a complete nutrient solution containing sufficient NaCl to produce total osmotic potentials of 0.5, -2.5, and -4.5 atm. Plots of relative grain yield in relation to osmotic potential of substrate revealed two general relationships, one for the short-season varieties and one for the long-season varieties. (Skogerboe-Colorado State)
W75-11603

SULFUR AND MANGANESE RELEASE FROM SOILS TREATED WITH PRILLED SULFUR AND SULFUR-BENTONITE,
Missouri Univ., Clinton. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-11604

MULTIPURPOSE SALT TREATED WATER HARVESTING SYSTEM,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3B.
W75-11828

RATE OF PHOSPHORUS SORPTION BY FIVE OKLAHOMA SOILS,
Robert S. Kerr Environmental Research Lab., Ada, Okla. National Water Quality Control Research Program.
For primary bibliographic entry see Field 3F.
W75-11836

PERFORMANCE OF RICE VARIETIES IN A HIGHLY SALINE SODIC SOIL AS INFLUENCED BY PLANT POPULATION,
Central Soil Salinity Research Inst., Karnal (India). Div. of Soils and Agronomy.
K. S. Dargan, I. P. Abrol, and D. R. Bhumbla.
Agronomy Journal, Vol 66, No 2, p 279-280, March-April, 1974. 2 tab, 3 ref.

Descriptors: *Salinity, *Saline soils, *Crop response, *Rice, Plant populations, Germination, Alkalinity, Reclamation, *Sodic soils.

It is generally recognized that increased initial plant population or increased seeding rate in saline sodic soils would compensate for decreased germination, and seeding mortality. However, there is little or no experimental evidence of the gains obtained from such a practice. In present investigation, the performance of seven rice varieties at three plant populations in a highly saline sodic soil was studied in the field at the Central Soil Salinity Research Institute, Karnal, India. Varieties tested were the tall indica types 'Jhona 349'; 'Jhona 351,' 'Basmati 217,' and 'Basmati 370' and the semidwarf types 'IR 8,' 'IR8-68' and 'Jaya'. Plant populations used were 2, 4, and 6 transplants/hill. Variety IR 8-68, a local selection from IR 8, with 6 transplants/hill gave the significantly highest grain yield at 57.33 quintals/ha. Variety IR 8 at 6 transplants/hill and Jhona 349 at 4 transplants/hill yielded next in order. Increase in plant population from 2 to 4 and 6 transplants/hill resulted in significantly higher grain yield in all varieties except Jhona 349 where there was a decrease at 6 transplants/hill. Increased yield resulted from increased survival of hills and greater number of panicle-bearing tillers per hill. (Skogerboe-Colorado State)
W75-11838

IRRIGATION MANAGEMENT FOR SALT CONTROL,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. van Schilfgaarde, L. Bernstein, J. D. Rhoades, and S. L. Rawlins.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 100, No IR3, p 321-338, September, 1974. 8 fig, 5 tab, 27 ref, 2 append.

Descriptors: *Salinity, *Saline soils, Saline water, Irrigation effects, Irrigation practices, Irrigation operation and maintenance, Irrigation water, *Water management(Applied).

Combination of a reevaluation of established crop salt tolerance data, recent advances in understanding of soil chemistry and application of soil physics principles leads to a proposed management system for irrigation that can result in significant reductions in the amount of salt discharged for irrigation projects. These concepts can play a major part in advancing irrigation agriculture, while meeting the challenge of minimizing water quality degradation. Adoption will require changes in irrigation management that call for far closer control of amount and uniformity of water applied than is customary. (Skogerboe-Colorado State)
W75-11845

3D. Conservation In Domestic and Municipal Use

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS. ECONOMIC, LEGAL AND FINANCIAL ASPECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W75-11352

COUNTY COMBATS URBAN STORM WATER RUNOFF PROBLEMS,
Mecklengurg County, Engineer's Office, Charlotte, N.C.
For primary bibliographic entry see Field 5G.
W75-11390

STORM AND COMBINED SEWER ABATEMENT TECHNOLOGY IN THE UNITED STATES--AN OVERVIEW,
Environmental Protection Agency, Washington, D.C. Municipal Pollution Control Div.
For primary bibliographic entry see Field 5D.
W75-11414

ROLE OF COMPUTER SIMULATION IN ADMINISTERING AN URBAN DRAINAGE ORDINANCE,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6E.
W75-11669

WATER RESOURCES PLANNING IN URBAN AREAS,
Office of the Chief of Engineers (Army), Washington, D.C. Urban Studies Branch.
For primary bibliographic entry see Field 5D.
W75-11769

FORECASTING URBAN WATER USE: COMMERCIAL ESTABLISHMENTS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W75-11795

3E. Conservation In Industry

FLOAT-WASH FRACTIONATOR SAVES FIBRE AND WATER AT GRAND'MERE,
Consolidated-Bathurst Ltd., Grand'Mere (Quebec).
For primary bibliographic entry see Field 5D.
W75-11363

NEW EFFLUENT TREATMENT PLANT OPENED AT BRISTOL FOR BOARD MILLS.
For primary bibliographic entry see Field 5D.
W75-11364

WATCH THAT WATER,
For primary bibliographic entry see Field 5D.

W75-11368

TREATMENT OF WASTE WATER FROM TEXTILE DYEING PROCESS (SENSHOKU HAISUI SHORI),
For primary bibliographic entry see Field 5D.
W75-11374

PLATING AND CYANIDE WASTES (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W75-11545

REPORT OF ANALYSES FOR INDUSTRIAL WASTE WATER IN TWENTY-EIGHT FACTORIES, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5A.
W75-11671

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTE WATER TREATMENT IN CHLOR-ALKALI PRODUCTION,
Houston Univ., Tex. Dept. of Quantitative Management Science.
For primary bibliographic entry see Field 5D.
W75-11765

3F. Conservation In Agriculture

UTILIZATION OF WATER IN A SEMI-ARID REGION,
New Mexico State Univ., Clovis. Plains Branch Agricultural Experiment Station.
H. D. Fuehring.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 880, $3.75 in paper copy, $2.25 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report 059, September 1975, 35 p, 23 tab. OWRT B-029-NMEX(1).

Descriptors: *Antitranspirants, *Rain water, Surface runoff, Water conservation, Small watersheds, Moisture stress, *Sorghum, Nitrogen, *Water utilization, Droughts, Dry farming, Arid lands, *Crop production, Southwest US, New Mexico, Wheat.
Identifiers: *Atrozine, Rain-water efficiency, *Southern High Plains(NMex), Sunflower.

A five-year study in the Southern High Plains (annual rainfall of 16 inches) using combinations of bare micro-watershed and growing bed widths resulted in increased crop yields on the growing beds as the proportion of micro-watershed was increased. However, yields for the entire area (including both bed and shed) decreased. Limited work indicated the possibility of also cropping the shed areas and it was concluded that this would be a more practical way of utilizing micro-watersheds. Grain sorghum and sunflowers were successful dryland crops on both beds and sheds while wheat was more suitable as a crop on the sheds rather than on the beds. The use of an antitranspirant (atrazine) gave promising results on grain sorghum but further work is needed. (Hain-New Mexico State)
W75-11356

EFFECTS OF SOIL TEMPERATURE AND SOIL MOISTURE IN PODDING ZONE ON POD DEVELOPMENT OF PEANUT PLANTS, (IN JAPANESE),
Ministry of Agriculture and Forestry, Konosu (Japan). Central Agricultural Experiment Station.
Y. Ono, K. Nakayama, and M. Kubota.
Proc Crop Sci Soc Jpn, Vol 43, No 2, p 247-251, 1974, Illus.

Descriptors: *Soil temperature, *Soil moisture, *Peanuts, Plant physiology.
Identifiers: Podding zone, *Pods(Peanuts).

To examine the effects of soil temperature and soil moisture in the podding zone on the pod development of a peanut variety. Chiba-handachi (large seed, semi-erect type), 3 experiments were carried out under the condition separating the podding zone from that in which the roots were grown. In experiment-I, the mean soil temperatures in the podding zone were 38.6 C, 30.6 C, 22.9 C and 15.3 C. Experiment-II was performed under 4 soil moisture conditions, namely 57.3, 40.3, 21.5 and 7.8% of total soil volume. In experiment-III, the effects of the treatments combining high soil temperature (37-39 C) and low soil moisture (6-8%) in the podding zone; every 10 days after the peg penetration, development was examined. The inception and rate of the pod development were affected remarkably by soil temperature. In the podding zone, optimum soil temperature was 31-33 C; minimum soil temperature was 15-17 C; and maximum soil temperature was 37-39 C. The optimum soil moisture content in the podding zone was about 40% of total soil volume, regardless of the soil moisture content in the rooting zone. When the soil moisture content was lower than 40%, the podding percentage and the thickening growth of the pod were reduced, and when it was higher than 40%, only the thickening growth of the pod was reduced. The most critical period in the pod stage is the 1st 30 days, especially 20-30 days after peg penetration.--Copyright 1975, Biological Abstracts, Inc.
W75-11456

INFILTRATION AND RUNOFF FOR SMALL FIELD PLOTS UNDER CONSTANT INTENSITY RAINFALL,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 3B.
W75-11458

RIVER REGIME WITH SPECIAL REFERENCE TO RIVER NILE,
Assiut Univ. (Egypt). Dept. of Hydraulics.
For primary bibliographic entry see Field 2J.
W75-11464

GRAIN SORGHUM EVAPOTRANSPIRATION AND WATER USE EFFICIENCY UNDER TRICKLE IRRIGATION,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
T. A. Howell, and E. A. Hiler.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma. Paper No 74-2046. 23 p, 5 fig, 3 tab, 38 ref.

Descriptors: *Grain sorghum, *Evapotranspiration, *Irrigation practices, Irrigation systems, Irrigation, Water utilization.
Identifiers: *Trickle irrigation, *Drip irrigation.

Water use efficiency of grain sorghum may be increased by tulizing trickle irrigation to apply frequent, but small irrigation quantities and limiting these applications according to the stage of plant development. Water deficits which occur before the milk to soft dough stage of grain sorghum development can reduce yield and water use efficiency. However, careful regulation of the irrigation quantity to minimize water deficits during those periods can increase water use efficiency. Stage II (boot to bloom) is the most critical period. Utilizing an existing soil water balance model to determine plat transpiration futher reinforced this conclusion when the yield per unit of transpired water was computed. (Skogerboe-Colorado State)
W75-11582

MOISTURE AVAILABILITY AND CROP PRODUCTION,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
G. H. Hargreaves.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-4010. 13 p, 1 fig, 2 tab, 7 ref.

Descriptors: *Crop production, *Moisture availability, Moisture deficit, Evapotranspiration, Irrigation, Irrigation design, Methodology.

Although yield data are available for agricultural crops at many locations, there is a scarcity of data relating yield to moisture availabilty. Improved evaluation of the effect of moisture could be accomplished through improved standaridization and more uniformity in reporting procedures. Many interacting factors result in various levels of crop yields. However, there is a surprising degree of uniformity in response to level of moisture availability when data from various experiments are analyzed in a standardized manner. General acceptance of more complete and thorough methods for the quantitative evaluation of moisture deficiencies will improve the valuation of climate as a resource to be considered in development. The methodology given also provides a useful tool for irrigation development planning, irrigation design and the scheduling of irrigation applications. (Skogerboe-Colorado State)
W75-11583

'CHAMBER METHOD' FOR DRIP IRRIGATION SYSTEM DESIGN AND INSTALLATION PROCEDURES,
Massachusetts Univ., Amherst. Dept. of Food and Agricultural Engineering.
E. S. Pira.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma. Paper No 74-2047. 12 p, 6 fig, 2 tab, 6 ref.

Descriptors: *Irrigation design, *Head loss, *Design criteria, Irrigation methods, Flow rates, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

High pressure water is supplied through a 'quick-fill' and pressure reducing means to a low pressure distribution chamber. Relatively uniform pressure along the length of the chamber produces relatively uniform flow from the drippers. System designs, components, and installation procedures based on laboratory and field tests are discussed. Darcy's pressure loss equation and Bernoulli's flow equation provide a basis for designing chamber method irrigation systems. Drippers with tubing segments attached as described will eliminate dripper failure problems. The chambers must be charged rapidly for efficient system operation. The diameter of the chamber is the determining factor which limits the number of drippers that can be used and the maximum chamber length. Relatively uniform pressures can be maintained from the beginning to the end of the chamber, at low flow rates. Consequently, flow from the drippers is relatively uniform. Flow rates from the drippers can be adjusted by changing the pressure in the chamber. (Skogerboe-Colorado State)
W75-11584

FIELD TEST OF SOIL WATER FLUX METERS,
Agricultural Research Service, Riverside Calif. Salinity Lab.
For primary bibliographic entry see Field 2G.
W75-11586

OPTIMIZING WATER UTILIZATION THROUGH MULTIPLE CROPS SCHEDULING,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.

W. Huang, T. Liang, and I. Wu.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-2043. 26 p, 8 fig, 6 tab, 19 ref.

Descriptors: *Water utilization, *Scheduling, *Optimization, Linear programming, Model studies, Crops, *Hawaii, *Reservoir operation.

A deterministic linear programming model is developed for optimal use of water resources in a small Hawaiian reservoir system. Results from the application of the model show that through multiple cropping schemes, efficient use of water can be achieved and production acreage can be expanded. (Skogerboe-Colorado State)
W75-11587

SIMULATION OF CROP RESONSE TO ENERGY INPUTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
D. W. Williams, and W. J. Chancellor.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-5019. 39 p, 11 fig, 8 tab, 11 ref, 3 append.

Descriptors: *Mathematical models, Crop production, *California, Simulation analysis, Energy, Computer.
Identifiers: Energy shortages.

Mathematical models of crop yields as a function of five energy-related inputs were developed for California Agriculture. The models were used in a computer simulation to determine the effects of shortages of the inputs upon total crop production. (Skogerboe-Colorado State)
W75-11588

COMPARING TRICKLE, SUBSURFACE AND SPRINKLER IRRIGATION SYSTEMS,
South Dakota State Univ., Brookings. Water Resources Inst.
D. D. Brosz, and J. L. Wiersma.
Presented at 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-2045. 16 p, 5 fig, 7 tab, 4 ref.

Descriptors: *Subsurface irrigation, *Sprinkler irrigation, Irrigation systems, Crop response, Corn(Field), Potatoes, Irrigation efficiency.
Identifiers: *Trickle irrigation, Drip irrigation.

Three years of data were collected on yield responses of potato and hybrid corn crops irrigated by trickle, subsurface, and sprinkler irrigation systems. The study was conducted on field plots which included six irrigation system design treatments that were replicated three times. The design treatments included every row and every other row trickle and subsurface irrigation, small frequent sprinkler application, and larger, less frequent sprinkler applications. Potato and corn production could be increased by 5 to 15 percent with 20 percent less water applied through the use of trickle and subsurface irrigation. A water savings of 30 to 40 percent could possibly be achieved with trickle and subsurface irrigation for yields that are essentially the same as those obtained with sprinkler irrigation. Trickle and subsurface irrigation systems allow for a more efficient water management operation. Tensiometers installed in the research plots showed that the soil water tension was higher for the trickle and subsurface plots. The irrigation system design treatments had no effect on potatoe crop maturity or quality. The sprinkler irrigation system design that applied small, frequent water depths did have an effect on the grain quality of a corn crop in that black masses of spores appeared on the ears of the corn plant. (Skogerboe-Colorado State)
W75-11589

A COMPARISON OF 15N-DEPLETED AND 15N-ENRICHED FERTILIZERS AS TRACERS,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
J. L. Starr, F. E. Broadbent, and P. R. Stout.
Soil Science of America Proceedings, Vol 38, No 2, p 266-267, March-April, 1974. 1 fig, 1 tab, 3 ref.

Descriptors: Fertilization, *Nitrogen, Isotope studies, Crop response, Nitrates, *Tracers, Absorption, *Fertilizers.
Identifiers: *Ryegrass.

((14)NH4)2SO4 from which virtually all (15)N had been removed was compared as a tracer with (NH4)2SO4 containing 8.95% (15)N excess in a plant uptake experiment using soil columns maintained at 1/3 bar tension and conventional greenhouse pots. Uptake of fertilizer nitrogen in three cuttings of ryegrass was identical with the two fertilizers. Estimates of residual fertilizer N in the pots agreed less closely, owing to the high dilution factor. (Skogerboe-Colorado State)
W75-11591

PREDICTING EXCHANGEABLE SODIUM RATIOS IN IRRIGATED TROPICAL VERTISOLS,
Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 3C.
W75-11595

NITRIFICATION AND DENITRIFICATION DURING MISCIBLE DISPLACEMENT IN UNSATURATED SOIL,
California Univ., Davis.
C. Kirda, J. L. Starr, C. Misra, J. W. Biggar, and D. R. Nielsen.
Soil Science Society of America Proceedings, Vol 38, No 5, p 772-776, September-October, 1974. 5 fig, 1 tab, 15 ref.

Descriptors: *Nitrification, *Denitrification, *Leaching, Diffusion, Soil water, Soil properties, Soil chemistry, Unsaturated flow.
Identifiers: Microbial growth, Nitrogen transformations.

Nitrification and denitrification during the leaching of a pulse of NH4NO3 applied to the surface of soil columns are analyzed experimentally and theoretically. Experimentally, unsaturated soil columns of two lengths were leached steadily with a trace solution containing NH4NO3 while the air-filled portions of the columns were being flushed simultaneously with air. During these steady state conditions, a pulse of tracer solution containing either 15NH4(+) or 15NO3(-) was leached through the columns. The words tracee and tracer signify that both solutions were chemically identical with the latter containing a greater proportion of 15N. Steady-state tracee concentration distributions within the columns as well as the transient tracer concentration distributions in the effluent were analyzed assuming first-order kinetics. Values of both the rate coefficients and the concentration distributions stemming from the tracee and tracer measurements were in general agreement. The agreement between the measured and theoretical results are discussed in terms of soil water properties and the kinetics of microbial populations. (Skogerboe-Colorado State)
W75-11596

RICE RESPONSE TO NITROGEN AND PHOSPHORUS IN FLOODED AND NON-FLOODED SOILS,
National Fertilizer Development Center, Muscle Shoals, Ala.
G. L. Terman, and S. E. Allen.
Soil Science Society of America Proceedings, Vol 38, No 5, p 780-784, September-October, 1974. 3 fig, 5 tab, 12 ref.

Descriptors: *Rice, *Nitrogen, Nitrification, *Phosphorus, *Crop response, Greenhouse, Flood irrigation, Flooding.

Pot experiments were conducted in a greenhouse to study nutrition of rice under flooding and upland conditions. Yields of rice grown in one experiment on Mountview silt loam increased rectilinearly with 0-, 400-, and 800-mg rates of N/pot (5 kg of soil). Concentrations of N in grain + straw at maturity were uniformly low. Multiple rates of N from 250 to 2,000 mg/pot and P from 0 to 1,000 mg/pot (6.25 kg of soil) were applied for Nato rice grown on Mountview silt loam and Sango silty clay loam in a second experiment. Marked yield responses to N and P were obtained. Yields of straw and of grain + straw, N uptake, and N recovery were higher on nonflooded than on flooded soils. Grain yields, however, were slightly higher with flooding. Uptake of N, P, Ca, Mg, Mn, and Zn increased with yield response to N and P, while K uptake decreased on the Mountview soil. Concentrations of N and P increased with applied N and P, respectively, while concentrations of other nutrients were diluted in most situations with yield response to N or P on both flooded and nonflooded soils. These results indicate that with adequate applied nutrients, especially N, yields of rice with adequate water but without flooding can equal or even exceed those under flooding. (Skogerboe-Colorado State)
W75-11597

MODIFIED PENMAN EQUATION TO PROVIDE THE UPPER BOUNDARY CONDITION IN COMPUTING EVAPORATION FROM SOIL,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 2D.
W75-11598

COMPARATIVE EFFICIENCY OF SOLUBLE AND CONTROLLED-RELEASE SULFUR-COATED UREA NITROGEN FOR CORN IN TROPICS,
University of the West Indies, St. Augustine (Trinidad).
R. C. Dalal.
Soil Science Society of America Proceedings, Vol 38, No 6, p 970-974, November-December, 1974. 3 fig, 5 tab, 11 ref.

Descriptors: *Nitrogen, *Urea, *Nitrification, *Corn(Field), Crop response, Nutrients, Absorption.
Identifiers: Ammonium sulfate, Urea-ammonium phosphate, Nitrogen uptake.

The efficiency of the soluble-N sources, ammonium sulfate (AS), urea-ammonium phosphate (UAP) and urea and controlled-release-N source, sulfur-coated urea (SCU-8.9, SCU-1.1, and SCU-0.9) of differing N-release rates applied at 50, 100, and 200 kg/ha of N to an acidic soil, were compared in terms of N uptake and grain yield of corn. The apparent N recovery of added N, calculated by uptake differences from the control plots, was evaluated from N uptake by the two successive crops, one in the wet season and the other in the following dry season. In general, N uptake, grain yield, and apparent N recovery were increased by added N; which was opposite to the nitrification of these N sources except that the performance of urea was better than the other soluble-N sources, primarily because it had a smaller effect on soil pH and exchangeable Al. The inclusion of microbicide in the S-coatings of SCU had no influence on N efficiency or grain yield. More N was recovered from SCU with slower N-release characteristics irrespective of coating weight. Apparent recovery of added N was almost complete from urea, SCU-8.9, SCU-1.1 and SCU-0.9 when applied at the rate of 50 kg/ha of N, although the recovery at 200 kg/ha of N was about 50%. (Skogerboe-Colorado State)
W75-11601

RELATION BETWEEN NITRATE ABSORPTION AND WATER TRANSPIRATION BY CORN,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
C. F-H. Liao, and W. V. Bartholomew.
Soil Science Society of America Proceedings, Vol 38, No 3, p 472-477, May-June, 1974. 5 tab, 17 ref.

Descriptors: *Nitrates, *Absorption, *Transpiration, Leaching, Corn(Field), Crop response, Evapotranspiration, Diffusion.

The relationship between the absorption of NO3-N by young corn plants and the quantity of water transpired was studied in solution and soil culture. Tracer N was employed to measure NO3 absorption. Gravimetric methods were used to monitor evapotranspiration. From solution culture, NO3 was absorbed at rates relatively greater than water. From soil culture, NO3 was absorbed at a relative rate close to that of water when the soil was not pretreated. However, when the soil material was wetted and leached of soluble N before planting corn, NO3 was absorbed at a relative rate 1.5 to 2.0 times that of water. In soil situations where water was not being absorbed by plants, NO3-N likewise was not absorbed. Mass flow and diffusion both were involved in NO3 transport to roots. Prior cultural conditions had a marked influence on active uptake of NO3 presumably through an influence on specific rates of N absorption. (Skogerboe-Colorado State)
W75-11602

SALT TOLERANCE OF MEXICAN WHEAT: II. RELATION TO VARIABLE SODIUM CHLORIDE AND LENGTH OF GROWING SEASON,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 3C.
W75-11603

AGRICULTURAL DRAINAGE RESEARCH NEEDS AND PRIORITIES, 1974,
Agricultural Research Service, Baton Rouge, La.
For primary bibliographic entry see Field 4A.
W75-11632

PROCEEDINGS OF THE WATER HARVESTING SYMPOSIUM, PHOENIX, ARIZONA, MARCH 26-28, 1974.
Western Regional Research Lab., Berkley, Calif.
For primary bibliographic entry see Field 3B.
W75-11800

WATER HARVESTING FOR LIVESTOCK IN WESTERN AUSTRALIA,
Western Australia Dept. of Agriculture, Katanning. Soil Conservation Service.
For primary bibliographic entry see Field 3B.
W75-11801

WATER DEVELOPMENT IN MANAGEMENT OF LIVESTOCK AND WILDLIFE ON MOUNTAIN WILDLANDS,
Wasatch National Forest, Salt Lake City, Utah. Range, Wildlife and Watershed Management.
For primary bibliographic entry see Field 3B.
W75-11804

WATER HARVESTING CATCHMENTS ON INDIAN LANDS IN THE SOUTHWEST,
Bureau of Indian Affairs, Phoenix, Ariz.
For primary bibliographic entry see Field 3B.
W75-11809

HYDROLOGIC ASPECTS OF WATER HARVESTING IN THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2A.
W75-11811

DESERT STRIP FARMING--COMPUTER SIMULATION OF AN ANCIENT WATER HARVESTING TECHNIQUE,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3B.
W75-11812

A COMPUTER MODEL FOR OPTIMIZING DESIGN OF IMPROVED CATCHMENT,
Western Australia Dept. of Agriculture, Moora. Soil Conservation Service.
For primary bibliographic entry see Field 3B.
W75-11813

SEALING LEAKING EXCAVATED TANKS ON FARMS IN WESTERN AUSTRALIA,
Western Australia Dept. of Agriculture, South Perth. Soils Div.
For primary bibliographic entry see Field 3B.
W75-11814

WATER HARVESTING BY RUNOFF INDUCEMENT FOR IRRIGATION OF AN ALMOND ORCHARD IN A SEMIARID CLIMATE,
United Nations Development Program, New Delhi (India).
For primary bibliographic entry see Field 3B.
W75-11818

FIELD EVALUATION OF MICROWATERSHED AND VERTICAL MULCH SYSTEMS,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W75-11819

CROP PRODUCTION BY WATER HARVESTING,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3B.
W75-11823

RUNOFF UTILIZATION FOR GRAIN PRODUCTION,
Agricultural Research Service, Bushland, Tex. Southwestern Great Plains Research Center.
For primary bibliographic entry see Field 3B.
W75-11824

WATER HARVESTING FOR BARLEY IN A 30-CM WINTER RAINFALL AREA,
California Univ., Riverside.
For primary bibliographic entry see Field 3B.
W75-11825

OPPORTUNITY FOR HARVESTING WATER FROM AND ALONG HIGHWAYS IN RANGELAND AREAS OF WYOMING,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W75-11826

DIFFERENT SOIL TREATMENTS FOR HARVESTING WATER FOR RADISH PRODUCTION IN THE MEXICO VALLEY,
Escuela Nacional de Agricultura, Chapingo (Mexico). Dept. of Soils.
For primary bibliographic entry see Field 3B.
W75-11829

PARAMETERS FOR ESTIMATING ANNUAL RUNOFF AND SOIL LOSS FROM AGRICULTURAL LANDS IN RHODESIA,
Agricultural Engineering Centre, Salisbury (Rhodesia).
For primary bibliographic entry see Field 4A.
W75-11830

EFFECTS OF WATER MANAGEMENT AND SOIL AGGREGATION ON THE GROWTH AND NUTRIENT UPTAKE OF RICE,
California Univ., Davis. Dept. of Agronomy and Range Science.
A. J. Obermueller, and D. S. Mikkelsen.
Agronomy Journal, Vol 66, No 5, p 627-632, September-October, 1974. 5 tab, 20 ref.

Descriptors: *Water management(Applied), *Soil aggregates, Crop response, *Nutrients, Nutrient requirements, *Rice, *Crop production, *Flood irrigation, Surface irrigation, Irrigation practices, Root distribution, *Absorption.

Flooding is considered essential for the optimum growth and yield of rice (Oryza sativa). The benefits of flooding are not well understood, even though they have been associated with a reduction in soil moisture stress, alteration of root development, increased availability of plant nutrients, control of weeds, and a modified micro-climate environment. Since modification of soil aggregation may also influence some of the same plant responses as flooding, these effects were examined. The growth and development of rice, cv. 'Calrose,' was closely observed from seedling stage to maturity in a controlled greenhouse environment. At harvest the yield components, total yield of grain and straw, root production and distribution, and total uptake of N, P, K, Ca, Mg, Mn, An, Fe, and Si were determined. Rice plants grown under flooded conditions were superior to nonflooded plants except for the first 40 days after planting. Soil aggregation had little effect on the growth and development of flooded rice, but nonflooded rice was benefited by the puddled soil. (Skogerboe-Colorado State)
W75-11832

BASIC PRINCIPLES OF PULSE IRRIGATION,
Technion-Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
D. Karmeli, and G. Peri.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 100, No IR3, p 309-319, September, 1974. 2 fig, 3 tab, append.

Descriptors: *Irrigation systems, *Irrigation practices, Irrigation effects, Irrigation design, Sprinkler irrigation, *Application methods, Water conservation.
Identifiers: High frequency irrigation, *Pulse irrigation, Trickle irrigation, Drip irrigation.

The term pulse irrigation was defined qualitatively and quantitatively. This irrigation technique was described in terms of its main purpose which is the achievement of low application rate with the use of an irrigation device having a higher application rate. The present analysis based on mathematical and engineering considerations enables the determination of the characteristics of pulse irrigation (e.g., length of operating and resting time in a single pulse and the number of pulses). (Skogerboe-Colorado State)
W75-11833

EFFECT OF BACKFILL ON DRAIN FLOW IN LAYERED SOILS,
California Univ., Davis.
For primary bibliographic entry see Field 8D.
W75-11834

RATE OF PHOSPHORUS SORPTION BY FIVE OKLAHOMA SOILS,
Robert S. Kerr Environmental Research Lab., Ada, Okla. National Water Quality Control Research Program.
C. G. Enfield.
Soil Science Society of America Proceedings, Vol 38, No 3, p 404-407, May-June, 1974. 7 fig, 1 tab, 14 ref.

Descriptors: *Fertilizers, Fertilization, *Phosphorus, Equations, *Sorption, *Oklahoma, *Soils, Absorption.

Two equations are evaluated in relation to their suitability as rate equations for phosphorus sorption by selected Oklahoma soils. The rate equation which best fits experimental data was ds/dt = a(C to the b power) (S to the c power) where S is the sorbed concentration (mass per unit weight of the soils), C is solution concentration (mass per unit weight of the solution), t is time and a, b, and c are constants. (Skogerboe-Colorado State)
W75-11836

COMPARISON OF FOG IRRIGATION WITH SURFACE IRRIGATION IN CORN PRODUCTION,
Agricultural Research Service, Auburn, Ala.
B. D. Doss.
Agronomy Journal, Vol 66, No 1, p 105-107, January-February, 1974. 3 tab, 8 ref.

Descriptors: *Mist irrigation, *Furrow irrigation, *Surface irrigation, Crop response, *Corn(Field), Irrigation systems, Irrigation practices, Irrigation effects, *Crop production.
Identifiers: *Fog irrigation.

Water stress by plants during silking and ear development often affects the yield of corn. Water stress sometimes occurs during midday even with a relatively high soil water content. Field experiments were conducted for 3 years to determine the effect of fogging or mist irrigation alone, surface irrigation alone, and fogging plus surface irrigation on plant characteristics and grain and stover yields of corn. Plants received mist irrigation daily from 1000 until 1600 during silking and ear development. Surface irrigation was applied to maintain soil water at or above the 50% available level (0.8 bar) in the surface 60 cm of soil. An increase in grain yield was obtained in each of the 3 years with surface irrigation and in 2 of the 3 years with fogging or mist irrigation, but fogging in addition to surface irrigation did not increase grain yields above those for surface irrigation alone. Average grain yields for the 3 years were 6,200, 8,400, 9,200, and 9,500 kg/ha for no irrigation, fogging, surface, and fogging plus surface irrigation, respectively. (Skogerboe-Colorado State)
W75-11837

PERFORMANCE OF RICE VARIETIES IN A HIGHLY SALINE SODIC SOIL AS INFLUENCED BY PLANT POPULATION,
Central Soil Salinity Research Inst., Karnal (India). Div. of Soils and Agronomy.
For primary bibliographic entry see Field 3C.
W75-11838

QUANTITY AND FREQUENCY OF TRICKLE AND FURROW IRRIGATION FOR EFFICIENT CABBAGE PRODUCTION,
Agricultural Research Services, Phoenix, Ariz. Water Conservation Lab.
D. A. Bucks, L. J. Erie, and O. F. French.
Agronomy Journal, Vol 66, No 1, p 53-57, January-February, 1974. 4 fig, 3 tab, 9 ref.

Descriptors: *Crop production, Crop response, *Consumptive use, Evapotranspiration, Irrigation practices, Irrigation systems, Irrigation efficiency, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Cabbage.

Trickle irrigation, with its capability of small, frequent irrigation applications, has aroused considerable interest because of possible increased production and decreased water requirements. For this reason, a replicated field investigation was conducted to evaluate quantity and frequency of trickle, modified-furrow, and standard-furrow irrigations on the growth of cabbage, using a moderately saline water on a fine-textured soil. Trickle and modified-furrow irrigation were scheduled to supply various quantities of water based on ratios of the plant's estimated consumptive use at frequencies of 3, 6, and 12 days. Recorded data included yield, quality of production, and water-use efficiency. Results indicate that the consumptive-use requirement (38 cm of water in 1972) for high production of cabbage was about the same for all irrigation methods. Trickle and modified-furrow irrigation, however, did reduce furrow irrigation, showing that higher irrigation efficiencies can be attained with these new irrigation methods as opposed to conventional methods. (Skogerboe-Colorado State)
W75-11839

CHOICE OF IRRIGATION TIMING INDICATOR FOR NARROW ROW COTTON,
Kansas State Univ., Colby. Colby Branch Experiment Station.
D. G. Bordovsky, W. R. Jordan, E. A. Hiler, and T. A. Howell.
Agronomy Journal, Vol 66, No 1, p 88-91, January-February, 1974. 4 fig, 3 tab, 17 ref.

Descriptors: *Soil moisture, Soil-water-plant relationships, Water management(Applied), Irrigation efficiency, *Irrigation practices, Irrigation, Soil water potential, *Cotton.

This irrigation study was undertaken to compare water use efficiencies (WUE) resulting from three methods of timing water applications on narrow-row cotton. Irrigation timing during the 1971 and 1972 growing seasons was accomplished using the soil water potential (SWP)-fixed level, leaf water potential (LWP)-fixed level, and stress day index (SDI)-variable level of LWP, based on crop sensitivities, as indicators. Specific levels of each indicator were selected so that nearly identical yields would result for all three timing indicators, thus making possible the valid comparison of WUE. With the SWP indicator as a basis for comparison, higher WUE were obtained with the LWP and SDI indicators in both years. At a plant population of 150,000 plants/ha average increases in WUE (seed cotton yield divided by irrigation plus rainfall amounts) were 17 and 38% for the LWP and SDI indicators, respectively. These results demonstrate that significant benefits in stretching irrigation water supplies are possible when using plant-based measurements and when plant sensitivities at different growth stages are quantitatively considered in timing irrigations. (Skogerboe-Colorado State)
W75-11840

EVAPOTRANSPIRATION BY SUBIRRIGATED ALFALFA AND PASTURE IN THE EAST CENTRAL GREAT PLAINS,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
B. L. Blad, and N. J. Rosenberg.
Agronomy Journal, Vol 66, No 2, p 248-252, March-April, 1974. 4 fig, 4 tab, 14 ref.

Descriptors: *Evapotranspiration, *Subsurface irrigation, *Alfalfa, Pastures, Irrigation practices, Irrigation, Nebraska, Latent heat, Advection, Energy budget, *Great Plains.

Evapotranspiration (ET) rates from subirrigated alfalfa pasture were obtained to provide an estimation of the upper and lower limits of water demand for crops growing in climatic regions characterized by strong advection of sensible heat. Results of this study showed that ET rates were 20 to 25% lower in pasture than in alfalfa. These differences are much larger than any previously reported in the literture. Advected sensible heat supplied about 20% of the total energy consumed in the latent heat flux (LE) from alfalfa for the entire study and as much as 40% on certain days. In the pasture, however, with few exceptions, sensible heat was generated rather than consumed. (Skogerboe-Colorado State)
W75-11841

EFFECT OF PREPLANT-ONLY IRRIGATION ON COTTON YIELDS,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
J. D. Bilbro.
Agronomy Journal, Vol 66, No 6, p 833-834, November-December, 1974. 1 fig, 4 ref.

Descriptors: *Plant growth, *Crop response, *Cotton, Irrigation practices, Planting management, Irrigation, Dry farming, Irrigation effects.

Irrigation practices for cotton are changing on the Texas High Plains because the irrigation water supply is declining. The objectives of this study were to calculate yield probabilities for cotton planted on both early and late dates and grown with only a preplant irrigation, and then to compare these yield probabilities with those previously calculated for dryland conditions. Yields from early and late plantings that had received only a preplant irrigation for the period 1960 through 1971 were used for calculating probabilities for various yield levels. The expected average yields (50% probability) of the early and late plantings of preplant-irrigated cotton are 530 and 503 kg/ha, respectively; and about 70% of the time the respective yields will differ by less than 50 kg/ha. Thus, the yield potential of preplant-irrigated cotton was not greatly affected by a wide range of planting dates. Also, 50% of the time preplant-irrigated land can be expected to yield about twice as much as comparable dryland and to vary much less in year-to-year yields. (Skogerboe-Colorado State)
W75-11842

VARIATION IN EFFECTIVENESS OF SUPPLEMENTAL IRRIGATION ON SWEET CORN YIELD COMPONENTS,
Wisconsin Univ., Madison. Dept. of Agronomy.
R. H. Andrew, and G. G. Weis.
Agronomy Journal, Vol 66, No 3, p 345-350, May-June, 1974. 1 fig, 7 tab, 14 ref.

Descriptors: *Supplemental irrigation, *Crop response, *Sweet corn, Irrigation efficiency, Moisture availability, Moisture tension, Crop production, *Central US.

Supplemental irrigation is of increasing importance in the production of processing sweet corn in the humid Midwest. However, wide variation exists for efficiency of irrigation as related to uniformity and quality as well as yield of this crop. The present study was planned to measure the response of major sweet corn yield components to, and their interaction with, irrigation level as related to genotype, plant competition, and season and to provide guidelines for optimum production practice. Six hybrids were grown at three populations (39,000 49,000 and 59,000 plants/ha) under low and high irrigation levels on droughty sand in central Wisconsin over a 9-year period. Measurements were made of snapped weight, weight and number of usable husked ears, and percent of usuable ears expressed on a weight and a number basis. (Skogerboe-Colorado State)
W75-11844

IRRIGATION MANAGEMENT FOR SALT CONTROL,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.

W75-11845

ANALYSIS OF CANAL SEEPAGE TO INTERCEPTOR DRAIN,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
For primary bibliographic entry see Field 8A.
W75-11846

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS. ECONOMIC, LEGAL AND FINANCIAL ASPECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W75-11352

THE SPACE/TIME COEEFFICIENT METHOD FOR CALCULATION OF RAINWATER RUNOFF (DAS RAUMZEITBEIWERTVERFAHREN FUER DIE BERECHNUNG VON REGENWASSERABFLUESSEN),
For primary bibliographic entry see Field 5D.
W75-11384

COST BENEFIT ANALYSIS AS DIMENSIONING BASIS OF FLOOD CONTROL MEASURES: AN EMPIRICAL REPORT (NUTZEN-KOSTEN-ANALYSE ALS GRUNDLAGE DER DIMENSIONIERUNG VON HW-SCHUTZMASSNAHMEN- EIN ERFAHRUNGSBERICHT),
For primary bibliographic entry see Field 6B.
W75-11415

HABITAT HETEROGENEITY AND AVIAN COMMUNITY STRUCTURE IN NORTH AMERICAN GRASSLANDS,
Oregon State Univ., Corvallis. Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W75-11425

INFILTRATION AND RUNOFF FOR SMALL FIELD PLOTS UNDER CONSTANT INTENSITY RAINFALL,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 3B.
W75-11458

PREDICTION OF FLOOD VOLUME FROM SMALL HUMID REGION WATERSHEDS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Comprehensive Resources Programming.
S. L. Chiang.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Proceedings Paper 11466, p 817-828, July 1975. 5 fig, 1 tab, 13 ref, 2 append.

Descriptors: *Runoff forecasting, *Flood flow, *Surface runoff, *Small watersheds, *Hydrograph analysis, *Antecedent moisture content, *Ohio, *Pennsylvania, Hydrology, Humid areas, Hydraulics, Soil conservation.
Identifiers: Watershed parameters, Number of wetness curve.

The Soil Conservation Service approach of soil-cover complex concept was modified and refined for predicting runoff volumes from individual storms. Two definitions of runoff volume were examined. For each definition two approaches were investigated: (1) predicting runoff volume with soil-cover information and the SCS rainfall-runoff model, and (2) correlating runoff volumes with climatic and watershed parameters. The first approach required calibration of watershed wetness while the second used a direct correlation. Prediction equations were developed with 210 events from 15 Pennsylvania and Ohio watersheds less than 20 sq miles. Both approaches were tested on the 5 reserved watersheds with satisfactory results. The first approach was found superior to the second. The frequency distribution of watershed wetness associated with flood events was also presented. (Lardner-ISWS)
W75-11462

GENERATION OF HYDROLOGIC SAMPLES: CASE STUDY OF THE GREAT LAKES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W75-11476

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 6. MISSOURI RIVER BASIN--VOLUME 3, MISSOURI RIVER BASIN FROM SIOUX CITY, IOWA, TO NEBRASKA CITY, NEBRASKA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11486

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 8. WESTERN GULF OF MEXICO BASINS--VOLUME 2. BASINS FROM LAVACA RIVER TO RIO GRANDE.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11487

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 9. COLORADO RIVER BASIN--VOLUME 3. LOWER COLORADO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11488

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 10. THE GREAT BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11489

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON--VOLUME 1. PACIFIC SLOPE BASINS IN WASHINGTON EXCEPT COLUMBIA RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11490

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 13. SNAKE RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11491

FLOODS IN THE WAIAHOLE-WAIKANE AREA, OAHU, HAWAII,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 2E.
W75-11495

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Reston, Va.
I. C. James, II.
In: Proceedings of Sumposium on the Design of Water Resources Projects with Inadequate Data, Volume 1; Madrid, June 1973, sponsored by UNESCO-WMO-IAHS: Comite Espanol para el D H I, p 211-224, 1973. 2 fig, 3 tab, 16 ref.

Descriptors: *Reservoir design, *Reservoir operation, *Data collections, *Hydrologic data, Optimization, Cost-benefit analysis, Economics, Systems analysis.

Estimates are given for the optimal length of data sequences for reservoir design where operating rules are fixed, for operating rule determination where reservoir design is fixed, and for the combined determination of operating rules and reservoir size for a multipurpose reservoir where the benefit is a piecewise-linear function of storage and release. A strategy is developed for the economically efficient design of the combined program of additional data collection and project deferment. The shape of the benefits foregone versus time function is such that project deferment is usually optimal only where very short hydrologic records exist, and the effect on an uncertain project inception data is to increase the optimal-length of the data sequence. (Knapp-USGS)
W75-11500

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE GRAYS HARBOR DRAINAGES, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W75-11502

PREDICTIVE MODELING OF EFFECTS OF THE PLANNED KINDRED LAKE ON GROUNDWATER LEVELS AND DISCHARGE, SOUTHEASTERN NORTH DAKOTA,
Geological Survey, Bismarck, N.Dak.
J. S. Downey, and Q. F. Paulson.
Water-Resources Investigations 30-74, October 1974. 22 p, 4 fig, 7 plate, 38 ref.

Descriptors: *Pre-impoundment, *Reservoir sites, *Model studies, *Water levels, *North Dakota, Groundwater movement, Discharge(Water), Aquifer characteristics, Planning, Forecasting, Evaluation, Dam construction, Hydrogeology, Water level fluctuations, Computer models.
Identifiers: *Groundwater discharge forecasting, *Groundwater levels.

A digital model was used to describe a groundwater system in glacial deltaic deposits near Kindred, North Dakota, and to predict the effects of a planned lake on groundwater levels and groundwater discharge. A digital computer was used to solve the finite-difference equations for groundwater flow. The model analysis delineated an area of about 140 square miles (363 square kilometres) that would be affected by rising water levels as a result of the lake. The rise of water levels depends on time and hydraulic properties of the aquifer. The maximum projected rise in water levels should occure in about 50 years. Evapotranspiration from the water table is presently near maximum and therefore the projected water-level rise will not be controlled by evapotranspiration. Existing aftificial drains will be effective in limiting the extent of water-level rise. (Woodard-USGS)
W75-11503

HYDROLOGY FOR LAND-USE PLANNING: THE HILLSIDE AREA, ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
L. L. Dearborn, and W. W. Barnwell.
Open-file report 75-105, 1975. 46 p, 31 fig, 3 tab, 37 ref, 6 append.

Descriptors: *Water resources development, *Groundwater resources, *Land use, *Planning, *Alaska, Aquifer characteristics, Hydrogeology, Water quality, Water pollution sources, Sewage effluents, Streams, Water wells, Water supply, Water utilization, Surface waters, Hydrology, Well data, Drillers logs, Lithologic logs, Hydrologic data.
Identifiers: *Anchorage(Alaska).

Rapid residential growth of the Hillside area, Anchorage, Alaska, may cause depletion of aquifers and a change in quality of water resources as a result of extensive development of small-lot tracts. Groundwater yields are low and may be locally inadequate for single family requirements where wells produce from bedrock in the eastern Hillside region. At lower altitudes single family water requirements of 3 to 10 gallons per minute usually can be obtained, but aquifers capable of being pumped at larger yields for public supplies are uncommon. However, in a few localities, wells do produce 40 to 300 gallons per minute from sand and gravel aquifers lying within thick sequences of glacial till. Streamflow within the Hillside area is inadequate as a significant source of water for public supply. The relative vulnerability of streams, lakes, and groundwater to pollution caused by the discharge of liquid waste, particularly from onsite sewage-disposal systems, is moderate to high in about half the study area. At higher altitudes contamination of bedrock aquifers may occur if discharge of liquid wastes is not regulated. The deep sedimentary aquifers at lower altitudes are less susceptible to contamination. (Woodard-USGS)
W75-11504

WETLANDS - RELATED LEGISLATION IN THE UNITED STATES,
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 6E.
W75-11550

COASTAL RESOURCE USE: DECISIONS ON PUGET SOUND,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6B.
W75-11573

THE MANAGEMENT OF LAND AND WATER USE IN THE COASTAL ZONE: A NEW LAW IS ENACTED IN NORTH CAROLINA,
North Carolina Univ., Chapel Hill. School of Law.
For primary bibliographic entry see Field 6E.
W75-11575

DEVELOPMENT OF SALINITY CONTROL TECHNOLOGY IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W75-11585

OPTIMIZING WATER UTILIZATION THROUGH MULTIPLE CROPS SCHEDULING,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-11587

MERCER COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
A. D. Pulley.
February 1972. 83 p, 14 fig, 13 tab, 27 ref, 8 append.

Descriptors: *Water resources, *Surface waters, *Illinois, *Data collections, Lakes, Ponds, Reservoirs, Recreation, Streams, Reservoir sites, Geomorphology, Climatic data, Geology, Soil texture.
Identifiers: *Mercer County(Ill).

Mercer County, located in northwestern Illinois along a 23.2 mile stretch of the Mississippi River, has an area of 555 square miles and a population of 17,294 (1970 census). The drainage pattern is composed of 4 major and 2 minor stream systems that flow directly into the Mississippi River. The natural drainage system has been altered only along the Mississippi River floodplain where ditches and levees have been constructed and several streams have been dredged and straightened. Including the Mississippi River, there are 167.5 miles of flowing water. The county has 502 impoundments larger than 0.1 acre, for a total of 1198.4 acres. Of these, 415 have been artificially created while 87 are of natural origin. The largest body of public water is the 1400 acres of interlocked sloughs, marshes, and pools of the Kethsburg Wildlife Refuge. New water is added at a rate of 8.3 impoundments per year averaging 2.5 acres each. Nine potential reservoir sites have been identified which would have impoundment surface areas ranging from 90 to 5000 acres. (Humphreys-ISWS)
W75-11622

VERMILION COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
R. W. Horner, and K. L. Brummett.
August 1972. 68 p, 18 fig, 7 tab, 25 ref.

Descriptors: *Water resources, *Surface waters, *Illinois, *Data collections, Water quality, Water pollution, Streams, Rivers, Lakes, Reservoirs, Nitrates, Hardness(Water), Recreation, Geomorphology, Climatic data, Geology, Soil texture, Fishing, Ponds, Boating, Fish.
Identifiers: *Vermilion county(Ill).

Vermilion County, with a population of 97,047 (1970 census), is located on the eastern border of Illinois about 140 miles south of the Illinois-Wisconsin line and has an area of 898 square miles. Natural streams and drainage lines are well established, although a number of flat areas had to be artificially drained before they could be farmed. The county is drained for the most part by the Vermilion River and its tributaries. The southern one-fifth of the county drains directly to the Wabash River via the Little Vermilion River. The total impoundment acreage is 1668.35 acres. In addition, there are 164.2 miles of major streams, with a surface area of 1002.8 acres. Of the total impoundment acreage, 11.0% is state owned, 3.3% is public, 34.2% is organizational, 0.7% is fee fishing, and 50.8% is private water. The most important recreational lakes of the county are those of Kickapoo State Park. There are 8 potential impoundment sites. If the proposed Middle Fork Reservoir project is completed, its will expand the impounded water area of the county 200% and the amount of publicly-available water by 1000%. Water pollution is severe and in certain instances parts of some streams are so degraded that they no longer support fish life. Sources of pollution in the county are agricultural, industrial, and municiple. (Humphreys-ISWS)
W75-11623

LAWRENCE COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
R. E. Fisher, and H. P. Brown.
November 1971. 54 p, 13 fig, 8 tab, 24 ref.

Descriptors: *Water resources, *Surface waters, *Illinois, *Data collections, Streams, Water quality, Climatic data, Soil texture, Fishing, Ponds, Fish, Recreation, Geology, Water pollution.
Identifiers: *Lawrence County(Ill).

Lawrence County is 239,360 acres in size and located on the southeastern edge of Illinois. The estimated population is 18,000 people (1971). There are currently 633 artificial impoundments comprising a total of 530.45 surface acres of water. Approximately 64% of the water acreage is classified as ponds (under 6.0 acres in size). Seven areas classified as either 'State', 'Public', or 'organizational' waters total 117.7 surface acres. In addition to the artificial impoundments, there are 11 natural or oxbow lakes totaling 62.90 acres. There are three major streams which are considered to have a fishing resource: Raccoon Creek, Embarras River, and Wabash River. They comprise a total of 2196 surface acres or 64 stream miles. There are several locations for impoundments up to 10 acres in size that could be developed for public or private use, but there is only one area that will impound over 100 surface acres of water. (Humphreys-ISWS)
W75-11624

DE KALB COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
G. J. Tichacek, and H. L. Wight.
December 1971. 72 p, 16 fig, 20 tab, 66 ref, 1 append.

Descriptors: *Water resources, *Surface waters, *Illinois, *Data collections, Water quality, Water pollution, Streams, Lakes, Ponds, Hardness(Water), Recreation, Geomorphology, Climatic data, Geology, Soil texture, Fishing, Boating.
Identifiers: *De Kalb County(Ill).

De Kalb County, covering a total of 636 square miles, is on the extreme south-western fringe of the 'Northeastern Illinois Metropolitan Area'. It has a population of 71,654 (1970 census). Surface drainage is divided between the Rock and Illinois River basins by the Cropsey lobe of the Bloomington-Cropsey Morainal System. There are a total of 11 lakes 6.0 acres and larger (including the proposed Shabbona Lake) and 143 ponds, inundating a total of 550.3 acres. There are also 17 permanent streams, the surface area of which covers 617.4 acres. The combined impoundments and stream data provide a grand total of 171 water areas covering 1167.7 acres. The combined length of all named streams is 247.8 miles. The soils were derived from parent materials which were distributed by three agents: ice, water, and wind. Of the parent materials, glacial till was by far the more important in the formation of the present soils. Till of various origins is within 20 feet of the surface over 90% of the county. Most of the tills are quite distinctive, having definite color and texture. Because of surface relief patterns and farming very close to the stream bank, siltation is a major problem in the county streams. Water areas are not grossly polluted at this time; however, there have been numerous reports of pollution occurrences in the county streams over the past 20 years. The limited data available for chemical quality of surfaces waters show that alkalinities averaged 307.4 ppm for the 17 streams sampled and 161.0 ppm for the impoundments. Hardness concentrations ranged from 478.0 ppm to 649.4 ppm and averaged 556.6 ppm for 11 of the streams. (Humphreys-ISWS)
W75-11625

STUDIES OF FLOODPLAIN VEGETATION AND WATER LEVEL FLUCTUATION IN THE KISSIMMEE RIVER VALLEY,
Central and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept.
R. L. Goodrick, and J. F. Milleson.
Technical Publication 74-2, March 1974. 60 p, 10 fig, 3 tab, 8 ref, 2 append.

Descriptors: *Channel improvement, *Vegetation, *Water level fluctuations, *Florida, Vegetation ef-

fects, Vegetation regrowth, Vegetation establishment, Germination, Canals, Channeling, Structures, Drawdown, Environmental effects, Herbicides, Burning, Aquatic plants, Marsh plants, Aquatic weed control, Environment, Flood control.
Identifiers: *Kissimmee River(Fla).

The Central and Southern Florida Flood Control Project in the Kissimmee River Basin consisted of enlarging existing canals connecting the upper chain of lakes, installing water control structures in several of these canals, and channelizing and providing control structures in the river proper (which extends from Lake Kissimmee to Lake Okeechobee). One major canal, designated C-38, was constructed within the Kissimmee River floodplain. Six regulatory structures were situated along the canal to control the drop in elevation. Stabilization of the water level in the impoundment area behind the regulatory structures since January 1969 has had a pronounced impact on the vegetational composition of the marshes. The lack of seasonal fluctuation has resulted in the dominance of terrestrial plants in the north end of the impoundment, the dominance of aquatic plants in the south end of the impoundment, and the inhibition of growth for most aquatic annuals. When competition was eliminated or reduced substantially and the underlying substrate was exposed during a drawdown, many additional species of both annual and perennial plants germinated and flourished. (Sims-ISWS)
W75-11628

AGRICULTURAL DRAINAGE RESEARCH NEEDS AND PRIORITIES, 1974,
Agricultural Research Service, Baton Rouge, La.
C. E. Carter, W. W. Donnan, I. G. King, and G. O. Schwab.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 3, p 529-534, May-June 1975. 1 fig, 3 tab.

Descriptors: *Research priorities, *Drainage, *Agriculture, Surface drainage, Subsurface drainage, Channels, Outlets, Humid areas, Arid lands, Surveys, Planning.

Drainage research has played an important role in increasing food and fiber production in the United States. In the future its importance is expected to increase as farmers attempt to increase crop yield per acre to meet the increased demands for food and fiber both at home and abroad. Results of a survey made during 1973 to 1974 to determine drainage research needs in the United States was reported. Agencies in each state within the United States were contacted and requested to list drainage research needs. The agencies included the Soil Conservation Service, Agricultural Research Service, Water Resource Research Institutes, Agricultural Experiment Stations, Cooperative Extension Service, and Bureau of Reclamation. Responses were compiled separately for humid and arid (irrigated) states for three categories: (1) subsurface drainage, (2) surface drainage, and (3) channels and outlets. Responses were further subdivided within each of these categories for 13 different research needs. The research needs cited most frequently in the survey (in decreasing order of priority) were: water quality, design, materials, and economics for the subsurface drainage category; water quality, environment, design, and economics for the surface drainage category; and design, environment, water quality, economics, and minatenance for the channels and outlets category. (Sims-ISWS)
W75-11632

HYMO FLOOD ROUTING,
Agricultural Research Service, Temple, Tex.
J. R. Williams.
Journal of Hydrology, Vol 26, No 1/2, p 17-27, July 1975. 7 fig, 2 tab, 7 ref.

Descriptors: *Flood routing, *Rainfall-runoff relationships, *Synthetic hydrology, Flood forecasting, Flood control, Flood protection, Hydrographs, Floods, Computer programs.
Identifiers: *HYMO computer program, *Variable Travel Time(VTT) flood routing.

The Variable Travel Time (VTT) flood routing method was developed to account for the variation in travel time with stage and water-surface slope. The VTT method is suited for HYMO, a problem-oriented computer language for building hydrologic models, because it requires little computer storage, routes both channel and floodplain flows, performs reliably under widely varied conditions, and given consistent results over a wide range of routing intervals and reach lengths. Although the solution is iterative, the VTT method requires little computer time and is free of convergence problems often encountered in more complex routing methods. By accounting for the variation in water-surface slope, the VTT method yields results that are comparable to the accurate results obtained with an implicit solution of the unsteady flow equations of continuity and motion. Yet the VTT method has the general applicability of storage methods. The use of the VTT method makes HYMO a useful and versatile model for water resources planning, water quality modeling, and hydrologic research. (Jess-ISWS)
W75-11647

APPLICATION OF A GENERALISATION OF WALD'S IDENTITY TO SOLVING CERTAIN MULTI-STREAM STORAGE PROBLEMS,
Monash Univ., Clayton (Australia). Dept. of Mathematics.
N. S. Barnett.
Journal of Hydrology, Vol 26, No 1/2, p 95-113, July 1975. 27 ref, 2 append.

Descriptors: *Stochastic processes, *Reservoir operation, *Markov processes, Synthetic hydrology, Systems analysis, Mathematical studies, Operations research, Reservoir storage, Reservoir releases, Streamflow, Dams, Flow control.
Identifiers: *Wald's identity, Random walk process.

The development of Wald's identity was traced with special reference to its application in solving storage problems. Research was specifically concerned with the problem of regulating the flow of water below the confluence of two streams by means of a dam built across one of them. Considering a model in which flows in the streams form independent Markov chains, expressions for the probability of emptiness and for p.g.f. of the time to first emptiness were obtained using a Markovian extension of Wald's identity. (Jess-ISWS)
W75-11649

ANALYSIS OF PLUNGING PHENOMENA IN WATER RESERVOIRS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
S. B. Savage, and J. Brimberg.
Journal of Hydraulic Research, Vol 13, No 2, p 187-205, 1975. 9 fig, 9 ref.

Descriptors: *Density currents, *Froude number, *Flow profiles, *Gradually varied flow, Energy, Hydraulics, Analysis, Reservoirs, Density, Open channel flow, Equations, Underflow, Shear stress, Slopes, Interfaces, Depth.
Identifiers: *Plunging flow, One-dimensional analysis, Two-layer flow, Plunge line.

The plunging of denser inflow water into a reservoir was analyzed by two approaches. A simple energy conserving flow analysis yielded the depth at the plunge point. A gradually varied two-layer flow analysis gave the depth at the plunge point and predicted the interfacial profile for cases with resistance and sloping beds. Both analyses were compared with experimental results reported by other investigators. (Adams-ISWS)
W75-11655

BALANCING RESERVOIR--A KEY ELEMENT IN WATER SUPPLY PLAN,
Freese and Nichols, Fort Worth, Tex.
L. B. Freese.
Public Works, Vol 106, No 5, p 104-105, May, 1975. 1 fig.

Descriptors: *Water supply, *Pipelines, *Reservoirs, Rivers, Water treatment, Facilities, Construction materials, Synthetic rubber, *Texas.
Identifiers: *Balancing reservoirs, Cedar Creek Project(Tex), Ft. Worth(Tex).

The water supply of Fort Worth, Texas has come from impounded river sources for over fifty years. A long term plan, the Cedar Creek Project, was developed to increase the quantity and treatment of water impounded. The plan involved the Cedar Creek Reservoir, 80 miles southeast of Forth Worth; an intake pump station at the reservoir; 68.2 miles of 72-inch pipeline and associated pump stations, which reach from the reservoir intake to a balancing reservoir at the end of the 72-inch section of the pipeline; a balancing reservoir with a future capacity of 300 million gallons; and, 6.1 miles of 84 inch pipeline, connecting the balancing reservoir to the site of Fort Worth's Rolling Hills Treatment Plant. This $9.5 million plant was designed so that total capacity could be doubled without adding chemical facilities or increasing the number of administrative or laboratory buildings, and with the instrumentation for future computer control. The balancing reservoir, located six miles from the water treatment station, is situated on a hilltop so that a gravity line could be run without energy loss. Because this balancing pond is located so close to the city, a fail-sage lining was necessary. The large--620 feet square at the base and 875 feet square at the perimeter--reservoir was lined with impermeable membrane of nylon-reinforced 'Hypalon' synthetic rubber. The material is reinforced with a single layer of nylon scrim, offers improved strength and dimensional stability, is not adversely affected by soil chemicals, microorganisms, and is resistant to ozone and uv light. The costs of the project was $850,000, with $250,000 of this for the liner. (Prague-FIRL)
W75-11687

THE VALUE OF THE PEAK RUNOFF COEFFICIENT PSIS (UEBER DEN AUSSAGEWERT DES SPITZENABFLUSSBEIWERTES PSIS),
For primary bibliographic entry see Field 2A.
W75-11713

POLLUTION DETECTION AND RIVER QUALITY MANAGEMENT,
For primary bibliographic entry see Field 5A.
W75-11753

LAND USE AND ENVIRONMENTAL PLANNING: AN APPLICATION IN THE SOUTH CAROLINA COASTAL ZONE,
Battelle-Columbus Labs., Ohio.
For primary bibliographic entry see Field 6G.
W75-11766

DEVELOPMENT PLANNING OF LAGUNA DE BAY--PHILIPPINES,
Laguna Lake Development Authority, Manila (Philippines).
R. H. Gedney.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY12, Proceedings paper No. 10227, p 2367-2380, December 1973. 7 fig, 1 tab, 5 ref.

Descriptors: *Lakes, *Planning, *Environmental engineering, *Flood control, *Water supply, *Water quality, Hazards, Regions, Hydrology, Hydraulics, Lake morphology, Ecology, Fishe-

ries, Irrigation, Control, United Nations, International commissions, Economics.
Identifiers: *Laguna de Bay(Philippines), Lake elevation control.

Laguna de Bay is one of the largest lakes in southeast Asia and is already in the path of urban expansion of Manila. At present, the lake is brackish and is being studied for transformation into a fresh water supply. Development planning includes water supply, flood control, fisheries, irrigation, and land reclamation. Water quality management is a key factor in the lake development planning. A coordinated effort is being made by the Philippine Government and its development arm--the Laguna Lake Development Authority--to undertake the necessary research, assisted by a broad array of international bilateral and multibilateral agencies. Major findings of studies already completed and a description of work underway are presented. The overall program is aimed at the earliest possible development of the lake resources. (Bell-Cornell)
W75-11770

COOPERATION IN WATER RESOURCES PROGRAMS: ALASKA'S EXAMPLE,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
For primary bibliographic entry see Field 6B.
W75-11775

MODELS OF THE STOCHASTIC AND CHRONOLOGIC STRUCTURE, PREDICTION AND SIMULATION OF RUNOFF SEQUENCES - APPLICATION TO THE LOWER OHIO BASIN,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11783

FLOOD PLAIN INFORMATION: LEY CREEK, SALINA AND DEWITT TOWNSHIPS, ONONDAGA COUNTY, NEW YORK.
Army Engineer District, Buffalo, N.Y.
Prepared for Eastern Oswego Basin-Regional Water Resources Planning Board, June, 1971. 44 p, 38 fig, 5 plates, 5 tab.

Descriptors: *Floods, *Flood control, *Flood plains, *Legislation, *Water management, Flooding, Flood protection, *New York.
Identifiers: *Ley Creek(NY), Syracuse(NY), Salina Township(NY), Dewitt(NY), Onondaga County(NY), Intermediate Regional Flood, Standard Project Flood.

The 4.4 mile study reach of Ley Creek flows in a westerly direction from the junction of its North and South branches to its mouth at Onondaga Lake in Syracuse, New York. Its drainage area of 30 square miles includes 5 major tributaries. Streambed gradients are mild and flood plains generally flat. Nearly 3.4 of the flood plain is developed in commercial and residential properties as well as sanitary fill operations. Increasing population is encouraging more development. Flooding can occur any time of the year, but most severe floods occur during late winter and early spring when heavy precipitation is augmented by melting snow. Conditions are made worse by frozen saturated soil. Flood damage prevention measures include enlargement of creek channels, construction of riprapped channel walls, channel clearing and acquisition of rights-of-way. No flood plain regulations exist although New York state has several applicable water conservation acts which deter encroachment on the flood plain. A recent flood occurred in 1969 with estimated damage of $99,000. An Intermediate Regional Flood would be more damaging than the 1969 flood, cresting at 3.9 feet above stream bank. A Standard Project Flood would crest at 8.2 feet above bank level. This report aids in the understanding of local flood problems and privides land use guidance. (Salzman-North Carolina)
W75-11785

FLOOD PLAIN INFORMATION: FLOOD HAZARD REPORT OF 4-7 JULY 1969 FLOOD, HURON RIVER, NORWALK CREEK, OHIO.
Army Engineer District, Buffalo, N.Y.
May, 1970. 23 p, 28 fig, 12 plates, 3 tab.

Descriptors: *Flood damage, *Flood profiles, *Flood stages, *Floodways, *Historic floods, Flood data, Flood plains, Flood plain utilization, Planning, Reservoirs, Flood proofing, *Ohio.
Identifiers: *Hurnon River(Ohio), *Norwalk Creek(Ohio), Norwalk(Ohio), Flood plain management.

This report details flood conditions and damages of the July 1969 flood on the lower 26 miles of Huron River in northern Ohio and 3.5 miles of a tributary, Norwalk Creek. Although the gaging station on Huron River has been in operation since 1950, data for the peak of the stage-hydrograph for the July 1969 flood was established by indirect survey methods because the gage chart was damaged during the flood. The 1969 flood on Huron River has an estimated discharge of 48,900 cfs and an average recurrence interval of 126 years. The stage at the gage site was 31.1 feet, 7 feet higher than the next highest recorded flood which occurred in January, 1959. Extensive flood damage was estimated at greater than $4 million. Damages from Norwalk Creek through the city of Norwalk were approximately at $1.5 million. During the flood, the collapse of a reservoir wall resulted in closed highways, no domestic water supply and no power supply. The description of the flood and the numerous photographs show that damages will continue to increase if unwise development increases. Flood profiles indicate the amount of fill or elevation of flood proofing required to prevent future damage. The flood plain management program recommends control of future development of the establishment of a floodway. (Diefendorf-North Carolina)
W75-11787

FLOOD PLAIN INFORMATION: PLUM CREEK, BRUNSWICK HILLS AND MEDINA TOWNSHIPS, MEDINA COUNTY, OHIO.
Army Engineer District, Buffalo, N.Y.
Prepared for Ohio Department of Natural Resources, Division of Planning, Flood Plain Management Section, June, 1973. 26 p, 25 fig, 7 plates, 3 tab.

Descriptors: *Flood plains, *Flood damage, *Land use, *Planning, Flood plain utilization, Flood data, Flood profiles, Obstruction to flow, Flood stages, *Ohio.
Identifiers: *Plum Creek(Ohio), Medina County(Ohio), Brunswick(Ohio), Brunsick Hills Township(Ohio), Medina Township(Ohio), Sleepy Hollow Lake(Ohio), Lake Brunswick(Ohio), Flood plain management, Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

There is little development within the 5-mile study reach of Plum Creek which flows through Brunswick Hills and Medina Townships in northern Ohio averaging a fall of 21.4 ft/mi over its total 7.1 mile course. Most of the development is in the City of Brunswick or near man-made Sleepy Hollow Lake and Lake Brunswick. There has been little encroachment by man other than highway crossings, but natural obstructions such as dense growth and trees occur along the banks. Local government should establish a floodway to define and maintain the channel. Floods may occur at any time during the year, but are most numerous in late winter and early spring when snowmelt accompanied by moderate precipitation causes flooding. Information pertaining to past floods on Plum Creek is extremely scarce. Since there are no gaging stations within the study area, information from newspaper files and interviews was collected. There was no report of high water marks except in July, 1972 at the sewage treatment plant. The peak discharge of an Intermediate Regional Flood (IRF) within the study reach would range from 1660 to 3000 cfs with channel velocities of 2.2 to 4 ft/sec.; discharge of a Standard Project Flood (SPF) would range from 5630 to 9590 cfs with channel velocities of 3.2 to 4.9 ft/sec. The IRF is recommended by the State of Ohio Department of Natural Resources as the minimum flood level to define the limits of the regulatory flood plain. Brunswick Hills Township trustees are currently working on flood plain regulations. (Diefendorf-North Carolina)
W75-11788

FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for San Joaquin County; January 1974, 56 p, 11 tab, 23 fig, 37 plates.

Descriptors: *Flood plains, *Flood protection, *Flood damage, *Flood control, Flood forecasting, Flood data, Land use, Planning, Historic floods, Obstuction to flow, Flood plain zoning, Levees, *California.
Identifiers: *Calaveras River(Calif), *Bear Creek(Calif), Stockton(Calif), San Joaquin County(Calif), New Hogan Lake(Calif), Intermediate Regional Flood, Standard Project Flood, Flood plain management.

The Calaveras River and Bear Creek systems flood primarily agricultural land in San Joaquin County northeast of Stockton, California, during winter and spring rainfloods and summer cloudbursts. Protection in the study area is provided by New Hogan Dam on the Calaveras River, which also provides irrigation water. Levees built along the lower reaches of most of the streams also help minimize flood damage. Protection is provided against floods expected to occur at the 50-to-60 year frequency, but larger floods which would exceed channel capacity can be expected to occur. Peak flows estimated for a Standard Project Flood are 1,700 cfs on Calaveras River and 8,000 cfs on Bear Creek, according to calculations derived from the data collected at 8 gaging stations, combined with meteorological data. The greatest flood of record on the Calaveras River occurred in 1911, but far more damage was done in the study area in the floods of 1955 and 1958 because more of the area had been developed by then. In the 1958 flood, about 22,000 acres of the study area were flooded and damage was estimated at $1,400,000. Several levees were breached, and flood waters reached a maximum depth of 3 feet and remained on the land for as long as 3 weeks in the Bear Creek drainage area. The report provides a basis for planning optimum use of flood-prone areas. (Diefendorf-North Carolina)
W75-11789

FLOOD PLAIN INFORMATION: VENTURA RIVER, VENTURA COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
Prepared for the County of Ventura, June, 1974. 38 p, 25 fig, 22 plates, 7 tab.

Descriptors: *Floods, *Flood plains, *Flood profile, *Flow, *Obstructions to flow, *Flood damage, River, Flooding, Maximum probable flood, Historic flood, *California.
Identifiers: *Ventura River(Calif), Coyote Creek(Calif), Ventura County(Calif), Ventura(Calif), Intermediate Regional Flood, Standard Project Flood.

Along the Ventura River, major floods have been caused by winter storms of the polar Pacific type which occur November through April and account for 75% of the runoff. Mean seasonal precipitation is 16 inches near the mouth at the Pacific and 40 inches in the mountains at the upper end of the drainage area. Flash floods are typical of the Ventura River Basin; peak flows are attained within a

few hours of rainfall, last for a short time, and subside quickly. High velocities erode and carry large quantities of debris through the canyons and deposit the material on the more developed, gentler slopes of the valley. A levee along the east bank provides major flood protection from floods up to the Standard Project Flood for the City of San Buenaventura. Lake Casitas has a reservoir storage capacity which will substantially reduce peak discharges on Coyote Creek. Ventural County requires new development to be protected against flooding from major streams and its tributaries. Major floods of record occurred in January, 1969, with peak discharge of 58,000 cfs, and February, 1969, with 40,000 cfs peak discharge recorded near Ventura. High velocity flood waters and severe erosion occurred in both floods. Projected floods include the Intermediate Regional Flood (IRF) and the Standard Project Flood (SPF) with peak discharges at Ventura of 78,000 and 89,000 cfs respectively. These floods and resultant erosion would be hazardous to utilities and commercial and residential development in the floodplains in Ventura, Live Oak Acres, Oak View, and neighboring cities. (Park-North Carolina)
W75-11790

FLOOD PLAIN INFORMATION: CONTRARY CREEK, ST. JOSEPH, MISSOURI.
Army Engineer District, Kansas City, Mo.
Prepared for the City of St. Joseph, Missouri, October, 1973. 23 p, 11 fig, 15 plates, 3 tab.

Descriptors: *Floods, *Flooding, *Flood plains, *Flood data, *Flood profiles, *Levees, Flood forecasting, Flood discharge, Maximum probable flood, Obstructions to flow, *Missouri.
Identifiers: *Contrary Creek(Mo), St. Joseph(Mo), Intermediate Regional Flood, Standard Project Flood.

Contrary Creek, so called because it flows north contrary to the course of the Missouri River, drains 26 sq/mi adjacent to St. Joseph of which 17.7 sq/mi is above the upper study limit. The flood plain land is used primarily for agricultural production with a few roads and rail lines crossing the Creek. The channel has been widened and straightened and is bounded on both sides by levees. Short duration thunderstorms with high intensity rain, falling mostly in May through September, cause floods of high peaks, high velocities, short duration and relatively small volumes of runoff. Realignment of the lower reach of the Creek causes floodwaters overflowing banks or levees to flow into low lands north or south of the basin. Large floods occured in 1919, 1921, 1942, 1952, 1959, and 1960 but data is unavailable due to lack of stream gages. Expansion of St. Joseph will create pressure for development along Contrary Creek plus the possibility of larger floods. Peak flows for two projected major floods, an Intermediate Regional Flood (IRF) and a Standard Project Flood (SPF), would be 12,000 cubic feet/second (cfs) for an IRF and 21,000 cfs for the SPF and would compare to the estimated 14,600 cfs flow of the 1960 flood. In an IRF some floodwater will overflow the basin and flow north into the low-lying areas of St. Joseph. 'Floodwater overflowing the south levee will be contained between the levee and the road south of the levee. Water overflowing the north levee will remain along the toe of the levee.' Standing water will remain until the stream level falls and the drainage gates are opened. Severe erosion to stream banks and around bridge abutments are expected. The SPF would rise about 3 ft/hr peaking in 13 hours. (Park-North Carolina)
W75-11791

FLOOD PLAIN INFORMATION: CHITTENANGO CREEK, BRIDGEPORT, ONONDAGA AND MADISON COUNTIES, NEW YORK.
Army Engineer District, Buffalo, N.Y.
Prepared for Eastern Oswego Basin Regional Water Resources Planning Board, June, 1971. 38 p, 17 fig, 5 tab, 5 plates.

Descriptors: *Floods, *Flooding, *Flood protection, Flood control, Water management, Flood plains, Legislation, *New York, Flood forecasting, Flood plains.
Identifiers: *Chittenango Creek(NY), Bridgeport(NY), Onondaga County(NY), Madison County(NY), Limestone Creek(NY), Butternut Creek(NY), Intermediate Regional Flood, Standard Project Flood.

Chittenango Creek, a part of Oswego River watershed in western New York state, has two main tributaries, Limestone and Butternut Creeks. Draining an area of 288 square miles, the creek's gradient varies from 5 ft/mi to almost 50 ft/mi at its headwaters. Presently, the 7-mile study area near its mouth is used for agricultural or rural purposes, although increasing population of Syracuse area may create pressure for development. Floods occur all times of the year resulting from melting snow with moderate amounts of precipitation in the winter or intense summer precipitation. Natural vegetation as well as two bridges obstruct flood flow. No effective flood plain regulation exists in the area although New York State legislation supports such statutes and attempts to prevent encroachment by mandatory review of any stream disturbance. The greatest known flood occurred in August 1898 although insufficient information exists to determine its exact magnitude. A recent flood in 1960 had a peak discharge of 2,690 cfs. An Intermediate Regional Flood and Standard Project Flood would have peak discharges of 9500 cfs and 35,200 cfs respectively. Designated flood areas will assist local officials in regulating flood plain use. (Salzman-North Carolina)
W75-11792

HYGIENIC EVALUATION OF SPRING CAPPINGS USED ON THE SOUTHERN SHORE OF CRIMEA, (IN RUSSIAN),
Yalta Sanitary-Epidemiology Station (USSR).
For primary bibliographic entry see Field 5G.
W75-11793

AN ECONOMIC AND ENVIRONMENTAL RECONNAISSANCE OF THE POSSIBILITIES FOR SMALL WATERSHED DEVELOPMENT IN CHENANGO COUNTY,
Jones (Barclay) and Associates, Ithaca, N.Y.
For primary bibliographic entry see Field 4D.
W75-11796

PROCEEDINGS OF THE WATER HARVESTING SYMPOSIUM, PHOENIX, ARIZONA, MARCH 26-28, 1974.
Western Regional Research Lab., Berkley, Calif.
For primary bibliographic entry see Field 3B.
W75-11800

ENGINEERING ASPECTS OF WATER HARVESTING RESEARCH AT THE UNIVERSITY OF ARIZONA,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W75-11802

WATER DEVELOPMENT IN MANAGEMENT OF LIVESTOCK AND WILDLIFE ON MOUNTAIN WILDLANDS,
Wasatch National Forest, Salt Lake City, Utah. Range, Wildlife and Watershed Management.
For primary bibliographic entry see Field 3B.
W75-11804

SOIL TREATMENT WITH SILICONES FOR WATER HARVESTING,
Dow Corning Corp., Midland, Mich.
For primary bibliographic entry see Field 3B.
W75-11806

SEALING LEAKING EXCAVATED TANKS ON FARMS IN WESTERN AUSTRALIA,
Western Australia Dept. of Agriculture, South Perth. Soils Div.
For primary bibliographic entry see Field 3B.
W75-11814

STORAGE SYSTEMS FOR HARVESTED WATER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W75-11815

EVAPORATION SUPPRESSION FOR CONSERVING WATER SUPPLIES,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W75-11816

THE DESIGN OF ROADED CATCHMENTS FOR MAXIMUM RUNOFF,
Western Australia Univ., Nedlands. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3B.
W75-11817

USING PARAFFIN AND POLYTHYLENE TO HARVEST WATER FOR GROWING SHRUBS,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-11821

PARAMETERS FOR ESTIMATING ANNUAL RUNOFF AND SOIL LOSS FROM AGRICULTURAL LANDS IN RHODESIA,
Agricultural Engineering Centre, Salisbury (Rhodesia).
H. A. Elwell, and M. A. Stocking.
Water Resources Research, Vol 11, No 4, p 601-605, August, 1975. 2 fig, 4 tab, 12 ref.

Descriptors: *Runoff, *Rainfall-runoff relationships, *Runoff forecasting, *Soil erosion, *Semiarid climates, Africa, Subtropic, Agricultural runoff, Rainfall, Rainfall disposition, Soil conservation, Rainfall intensity, Vegetation effects, Impact(Rainfall), Grasslands, Cultivation, Arid climates.
Identifiers: Precipitation depth, Rainfall energy, Rainfall momentum, *Rhodesia.

Cumulative values of rainfall energy, momentum, and depth were investigated as predictors of annual soil loss and runoff from selected arable and grazing land field trial plots. Energy parameters were the most accurate predictors of soil loss from bare soils, explaining 96.4% of the variation in results from a clay loam and 80.0% from a sandy soil. Momentum, energy, and precipitation depth parameters were all close in their prediction of soil loss from the vegetated plots or as predictors of runoff from both bare and vegetated conditions, and consequently, precipitation depth parameters were selected as being the most practical for soil loss and runoff estimation under the conditions investigated. Percentage vegetal cover was shown to be an additional important variable on grassland. (Robinett-Arizona)
W75-11830

EFFECT OF BACKFILL ON DRAIN FLOW IN LAYERED SOILS,
California Univ., Davis.
For primary bibliographic entry see Field 8D.
W75-11834

ENVIRONMENTAL ASPECTS OF AQUATIC PLANT CONTROL,
Bureau of Reclamation, Denver, Colo. Div. of Research.
For primary bibliographic entry see Field 5G.
W75-11843

4B. Groundwater Management

IMPROVED APPLICATION OF GEOPHYSICS TO GROUNDWATER RESOURCE INVENTORIES IN GLACIATED TERRAINS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W75-11355

A CASE OF SUBTERRANEAN WATER POLLUTION CAUSED BY THE PUBLIC REFUSE DISPOSAL GROUND, (IN JAPANESE),
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
For primary bibliographic entry see Field 5B.
W75-11432

REGIONAL SEWERING AND GROUNDWATER QUALITY IN THE SOUTHERN SAN JOAQUIN VALLEY,
For primary bibliographic entry see Field 5D.
W75-11446

VARIABLE THICKNESS TRANSIENT GROUNDWATER FLOW MODEL USER'S MANUAL,
Battelle-Pacific Northwest Labs., Richland, Wash. Systems Dept.
For primary bibliographic entry see Field 2F.
W75-11469

REGIONAL CHEMISTRY OF GROUNDWATER IN THE WAINWRIGHT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W75-11471

RESPONSE OF UNCONFINED AQUIFER SYSTEMS TO DEEP PERCOLATION,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 2F.
W75-11474

HYDROGEOLOGY OF THE WAINWRIGHT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
D. A. Hackbarth.
Report 75-1, 1975. 16 p, 2 fig, 1 tab, 2 maps, 50 ref. $2.00.

Descriptors: *Canada, *Hydrogeology, *Geohydrologic units, *Geologic mapping, Water yield, Water quality, Water pollution, Nitrates, Groundwater availability, Mapping, On-site investigations, Geochemistry, Bedrock, Aquifers, Glacial drift, Groundwater movement, Water table, Springs, Artesian wells, Recharge, Potable water.
Identifiers: *Alberta, Flowing wells.

The Wainwright map area lies southeast of Edmonton between longitudes 110 degrees and 112 degrees west and latitudes 52 degrees and 53 degrees north. It covers about 6000 square miles of mostly aspen parkland. Precipitation is about 14 inches annually, while potential evapotranspiration is about 21 inches. Hydrogeological information is abundant for depths less than about 500 feet. At depths greater than 500 feet, the hydrologic environment has been inferred from geological information. Geologic units of hydrogeological interest include the glacial drift, preglacial sands and gravels, Horseshoe Canyon Formation, Bearpaw Formation, Belly River Formation, and Lea Park Formation. The latter four are Late Cretaceous in age. Groundwater yields are generally between 0 and 25 igpm, with certain areas having much greater yields. Groundwater quality is not exceptionally good; one third to one half of the samples analyzed exceeded provincial standards for total dissolved solids, sulfate, alkalinity, or sodium. Nitrate represents a local pollution problem. In addition to a groundwater availability map, maps are presented showing hydrochemistry of bedrock waters for the depth intervals 0 to 150 feet, 150 to 350 feet, and 350 to 500 feet. Hydrochemistry of drift waters from 0 to 150 feet of depth is also presented. (Visocky-ISWS)
W75-11475

SELENIUM IN WATERS IN AND ADJACENT TO THE KENDRICK PROJECT, NATRONA COUNTY, WYOMING,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-11492

GEOHYDROLOGIC RECONNAISSANCE OF THE UPPER POTOMAC RIVER BASIN,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-11493

DIGITAL-SIMULATION AND PROJECTION OF WATER-LEVEL DECLINES IN BASALT AQUIFERS OF THE ODESSA-LIND AREA, EAST-CENTRAL WASHINGTON,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-11494

GROUND-WATER DATA FOR BOLIVAR COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-11496

WATER QUALITY CHANGES RELATED TO THE DEVELOPMENT OF ANAEROBIC CONDITIONS DURING ARTIFICIAL RECHARGE,
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 5B.
W75-11497

GROUND-WATER LEVELS IN LOUISIANA--FOR WELLS MEASURED THROUGH 1974.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W75-11499

PREDICTIVE MODELING OF EFFECTS OF THE PLANNED KINDRED LAKE ON GROUNDWATER LEVELS AND DISCHARGE, SOUTHEASTERN NORTH DAKOTA,
Geological Survey, Bismarck, N.Dak.
For primary bibliographic entry see Field 4A.
W75-11503

HYDROLOGY FOR LAND-USE PLANNING: THE HILLSIDE AREA, ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W75-11504

UNSATURATED HYDRAULIC CONDUCTIVITY FROM CUMULATIVE INFLOW DATA,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 2G.
W75-11593

MATHEMATICAL MODELS OF ARTIFICIAL RECHARGE SYSTEMS,
California Univ., Davis. Dept. of Water Science and Engineering.
M. A. Marino.
Water Science and Engineering Paper No 2005, July 1975. 50 p, 17 fig, 1 tab, 34 ref. CSRS CA-D*-WSE-3082-H.

Descriptors: *Mathematical models, *Artificial recharges, *Groundwater recharge, Water table, Equations, Groundwater movement, Hydraulic conductivity, Aquifers, Numerical analysis, Digital computers, Graphical analysis, Recharge wells, Hydraulic properties, Hydraulics, Dupuit-Forchheimer theory, Percolation, *Methodology.
Identifiers: Predictor-corrector method, Alternating-direction implicit methods, Runge-Kutta method, Lagrange interpolation method, Dimensionless variables, Nonlinear solutions, Linear solutions, Circular recharge area, Rectangular recharge area, Nonuniform grid spacing, Mounds.

The nonlinear, partial differential equation characterizing the unsteady flow in an unconfined aquifer beneath a circular recharging area was solved numerically using a predictor-corrector method. The results obtained were compared with available linearized solutions. The predictor-corrector method resulted in a tridiagonal set of simultaneous equations which could be solved rapidly by computers. Furthermore, the method was computationally stable. A rectangular artificial groundwater-recharge system was analyzed by use of the alternating-direction implicit scheme with a nonuniform grid spacing. Values of the maximum height of the water table obtained from the numerical scheme were always higher than those calculated from an available linearized solution. A recharge well-unconfined aquifer system was analyzed by coupling the fourth-order Runge-Kutta method with the Lagrange interpolation method. The method was computationally inherently stable for any times. Dimensionless graphical solutions of water table profiles at different times were presented for various conditions. A closed-form solution based on the linearized equation was developed that closely approximates the flow system under consideration. Dimensionless graphical solutions for volume and average rate of recharge were presented for conditions commonly encountered in practice. (Visocky-ISWS)
W75-11626

SUBSURFACE WASTE INJECTION IN THE UNITED STATES: FIFTEEN CASE HISTORIES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 5D.
W75-11627

WELL PUMPING IN UNCONFINED AQUIFERS: THE INFLUENCE OF THE UNSATURATED ZONE,
Technion-Israel Inst. of Tech., Haifa. Faculty of Civil Engineering.
U. I. Kroszynski, and G. Dagan.
Water Resources Research, Vol 11, No 3, p 479-490, June 1975. 7 fig, 1 tab, 18 ref. USDA FG-Is-287.

Descriptors: *Groundwater, *Water table aquifers, *Unsaturated flow, *Unsteady flow, *Mathematical studies, Capillary conductivity, Hydraulic conductivity, Soil water movement, Aquifer characteristics, Aquifer testing, Numerical analysis, Finite element analysis, Drawdown, Equations, Approximation method, Wells.
Identifiers: Partially penetrating wells, Delayed yield, *Aquifer response, Type curves.

An approximate analytical solution describing transient flow toward a partially penetrating well pumped at a constant discharge in a rigid, homogeneous, anisotropic, unconfined aquifer of

infinite radial extension and finite depth, considering flow in the unsaturated zone above the free surface, was presented. The characteristic hydraulic properties of the unsaturated zone, namely the retention and hydraulic conductivity curves, were described by analytical expressions that depended on a parameter which roughly represented the effective thickness of the unsaturated zone. To check the validity of the approximate analytical solution, the problem, free of such approximations, was solved numerically by a finite element scheme for a representative particular case. Comparison between analytical and numerical solutions showed excellent agreement. The influence of the unsaturated zone was found to be negligible for most common cases encountered. In the marginal cases of very shallow rigid aquifers and of soils with particularly large unsaturated effective thickness, the influence of the unsaturated zone upon drawdown was found to be significant only at relatively short times, close to the pumping well and close to the free surface. (Prickett-ISWS)
W75-11631

A TOPOGRAPHIC-HYDROGEOLOGIC MODEL FOR SOLID WASTE LANDFILL SITING,
Iowa State Univ., Ames. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W75-11644

GEOCHEMISTRY AND GENSIS OF FLUORIDE-CONTAINING GROUND WATERS IN INDIA,
Soil Research Lab., Chandigarh (India).
For primary bibliographic entry see Field 2K.
W75-11645

THEORY OF GROUND-WATER RECHARGE FOR A STRIP BASIN,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 2F.
W75-11646

HYDRAULIC DESIGN OF VERTICAL STILLING WELLS,
Bureau of Reclamation, Denver, Colo. Div. of Research.
For primary bibliographic entry see Field 8B.
W75-11650

DETERMINING OPTIMAL WELL DISCHARGE,
Colorado State Univ., Fort Collins.
O. J. Helweg.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 101, No IR3, Proceedings paper No. 11566, p 201-208, September 1975. 5 fig, 6 ref, 3 append.

Descriptors: *Wells, *Discharge(Water), *Pumping, *Groundwater, *Irrigation, *Geohydrologic units, Optimization, Methodology, Cost-benefit analysis, Water supply, Drainage, Design, Cost-benefit ratio, Computers, Equations, Drawdown, Project planning, Systems analysis, Evaluation.
Identifiers: *Well yield, *Optimum use, Benefit maximization, Operating policy, Economic analysis, Well spacing.

The cost of pumping groundwater is a major factor in water supply; it is necessary to pump a given well at the discharge that maximizes the net benefit of the operation. Previous criteria have ignored the economic aspects of the analysis of this problem. This paper presents a method for determining the optimum operating policy of a well, i.e., at which discharge a well owner receives the most water for his money. A computer code, QOPTIM, is included along with an example of the analysis. The case treated is pumping an existing well at the optimum discharge, where drilling the well is a sunk cost. The real world example shows the importance of considering well losses in any analysis. An appendix lists QOPTIM, which can be easily used by most engineering offices to find the optimal discharge of a given well. The choice of criterion for finding the optimal well discharge is important. Application results of the cost-benefit, optimization method developed herein show power costs for a well to be $2,350/yr greater if the well is pumped at two thirds drawdown rather than at the optimal discharge as found using QOPTIM. (Bell-Cornell)
W75-11768

IDENTIFICATION OF PARAMETERS IN A LINEAR EQUATION OF GROUNDWATER FLOW,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W75-11799

4C. Effects On Water Of Man's Non-Water Activities

COMPARATIVE ANALYSIS OF ESTIMATION METHODS IN NONLINEAR FUNCTIONAL MODELS OF THE RAINFALL-RUNOFF PROCESS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2A.
W75-11354

COUNTY COMBATS URBAN STORM WATER RUNOFF PROBLEMS,
Mecklengurg County, Engineer's Office, Charlotte, N.C.
For primary bibliographic entry see Field 5G.
W75-11390

PROGRESS REPORT TO THE ARKANSAS STATE HIGHWAY COMMISSION FOR YEAR ENDING JUNE 30, 1975,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 8B.
W75-11501

METEOROLOGICAL, TOPOGRAPHICAL, AND CONSTRUCTION INFLUENCE ON THE RAIN RUNOFF IN SEWER SYSTEMS (METEOROLOGISCHE, TOPOGRAPHISCHE UND BAUTECHNISCHE EINFLUESSE AUF DEN REGENABFLUSS IN KANAL-ISATION-SNETZEN),
For primary bibliographic entry see Field 5D.
W75-11712

THE GROWTH OF POSIDONIA AND THE URBAN POLLUTION IN THE GULF OF GIENS, (IN FRENCH),
Institut Scientifique et Technique des Peches Maritimes, Nantes (France). Service de Pollution.
For primary bibliographic entry see Field 5C.
W75-11761

4D. Watershed Protection

PREDICTION OF FLOOD VOLUME FROM SMALL HUMID REGION WATERSHEDS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Comprehensive Resources Programming.
For primary bibliographic entry see Field 4A.
W75-11462

SEDIMENT RELATIONS OF SELECTED ALASKAN GLACIER-FED STREAMS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W75-11477

SOIL MOISTURE ACCOUNTING COMPONENT OF THE USDAHL-74 MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2G.
W75-11656

AN ECONOMIC AND ENVIRONMENTAL RECONNAISSANCE OF THE POSSIBILITIES FOR SMALL WATERSHED DEVELOPMENT IN CHENANGO COUNTY,
Jones (Barclay) and Associates, Ithaca, N.Y.
B. G. Jones.
Prepared in cooperation with New York State Office of Planning Services, Interim report, December, 1973. 336 p, 24 fig, 11 tab, 46 ref.

Descriptors: *Flood damage, *Watershed management, *Impoundments, *Flood control, Flood protection, Surface runoff, Water storage, Reservoir sites, Dams, Multiple purpose projects, Environmental effects, *New York.
Identifiers: *Chenango County(NY), Norwich(NY), Ostelic River(NY), Chenango River(NY), Unadilla River(NY), Susquehanna River.

Chenango County in the Eastern Susquehanna River Basin Northeast of Binghamton, New York, has experienced severe damage from past floods. Agricultural and non-agricultural damage costs are shown for the 52 reaches along principal watersheds (Ostelic, Chenango, Unadilla Rivers) and some small drainage area directly tributary to the Susquehanna River. Average annual flood damage in the county is estimated at $413,600; 85% non-agricultural, 15% agricultural. Estimates show that the record flood of 1935 occurring in 1969 would cause over $1 million in damage, and far more severe floods and possible. Since 1935, extensive channelization, levee construction, and other flood control work has been completed. This report considers 68 proposed impoundments for local and downstream flood control, a total of 25,000 acres of reservoir surface area (compared to 1,280 acres, or 0.22% of the county, presently covered). Information is given for each project showing location, description, disrupted land uses, wildlife impact, development potential, and economic costs and benefits, where available. County-wide policies and a comprehensive plan are urged which will consider impoundments as a focus for development as well as flood control. Thus all proposed projects, including those rejected in project-by-project review, are included. State and federal funding sources are described. (Herr-North Carolina)
W75-11796

FIELD EVALUATION OF MICROWATERSHED AND VERTICAL MULCH SYSTEMS,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W75-11819

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

THE CRYSTAL AND MOLECULAR STRUCTURE OF SELECTED PESTICIDAL WATER POLLUTANTS,
Rhode Island Univ., Kingston. Dept. of Chemistry.

C. J. Cheer.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 888, $3.75 in paper copy, $2.25 in microfiche. Rhode Island Water Resources Center, Kingston, Completion Report, (1975). 41 p, 3 fig, 7 tab, 21 ref. OWRT A-051-RI(1), 14-31-001-5040.

Descriptors: *Molecular structure, *Crystallography, *X-ray diffraction, *Pesticides, Pesticide kinetics, Chemical properties, Organic compounds, *Pollutant identification.
Identifiers: *Padan, Nereistoxin, Cholinergic activity, Hydrochloride compounds.

The solution of the crystal and molecular structure of Padan by single crystal x-ray diffraction confirmed that the compound under investigation is 1,3-bis(thiocarbamoyl)-2-N,N-dimethylaminopropane hydrochloride. The results indicate that the structure of Padan is very similar to that of acetylcholine. The similarity may be responsible for its activity in cholinergic systems.
W75-11351

DETECTOR OF TRACE SUBSTANCE IN WATER,
Shibata Kagaku Kikai Kogyo Kabushiki, Tokoyo (Japan). (assignee).
T. Fujinaga, and K. Miura.
United States Patent 3,883,414. Issued May 13, 1975. Official Gazette of the United States Patent Office, Vol 934, No 2, p 733-734, May, 1975. 1 fig.

Descriptors: *Analytical techniques *Pollutant identification, *Electrolytes, *Patents, Waste identification, Monitoring, Trace elements.

A system for detecting trace amounts of impurities in water has been patented. The system comprises the following: means for supplying supporting electrolyte; first flow electrolyte cell means coupled to the supply means for purifying the supporting electrolyte; sample injector means including a sample reservoir coupled to the first cell means for injecting the contaminated sample; at least two additional flow electrolyte means including a second cell coupled to the sample injector means and a third cell coupled to the second cell; depolarizer electrolyte supply means coupled to the casing of each cell means; and, recorder coupled to the potentiostats of the additional cell means. Each of the electrolyte cells contains a casing and a potentiostat means. The casings include an auxiliary electrode. The depolarizer electrolyte flows through the casing to contact the auxiliary electrode. The recorder records the output of the potentistats of the electrolyte cells; the output is indicative of the amount of impurities in the sample. (Orr-FIRL)
W75-11388

INSTRUMENTAL INVESTIGATION OF BIOLOGICAL WASTE WATER TREATMENT (A SZENNYVISEK BIOLOGIAI TISZTITASANAK MUSZERES VIZSGALATA),
For primary bibliographic entry see Field 5D.
W75-11407

AN AUTOMATED SPECTROPHOTOMETRIC SUSPENDED SOLIDS ANALYSIS FOR ACTIVATED SLUDGE,
Municipality of Metropolitan Seattle, Renton, Wash. Renton Treatment Plant.
For primary bibliographic entry see Field 5D.
W75-11408

INTERLABORATORY STUDY OF METHODS FOR CHEMICAL ANALYSIS OF WATER,
National Swedish Environment Protection Board, Stockholm. Research Lab.
G. Ekedahl, P. Junker, and B. Rondell.
Journal Water Pollution Control Federation, Vol 47, No 4, p 858-866, April, 1975. 5 fig, 1 tab, 12 ref.

Descriptors: *Nutrients, *Pollutant identification, *Chemical analysis, Laboratory tests, *Water analysis, Nitrogen, Phosphorus, Analytical techniques.
Identifiers: *Sweden, Intercalibration, Interlaboratory studies.

A program for the intercalibration of methods for chemical analysis of nutrients was conducted in Sweden. Artifical samples with accurately calculated concentrations of known constituents were used for water analysis. Samples were preserved by acidification and distributed in sealed glass ampoules. These samples were then distributed to 76 laboratories where individual methods of analysis were used. Discussion and evaluation of results focused on methods and instrumentation; preservation, stability and pre-treatment of samples; and quality of work in different laboratories. For all parameters studied (such as phosphate phosphorus, total phosphorus, nitrate nitrogen) the Nordic Standard Methods yielded the best results. Most laboratories tested performed the analytical work with acceptable precision. (Prague-FIRL)
W75-11409

THE USE OF COMPUTERS FOR FORECASTING THE SANITARY SYSTEMS OF WATER BODIES (PRIMENENIYE EVM DLYA PROGNOZIROVANIYA SANITARNOGO SOSTOYANIYA VODOYEMOV),
For primary bibliographic entry see Field 5D.
W75-11410

CONTINUOUS DETERMINATION OF TOXICITY OF EFFLUENTS.
French Patent 13200W/08. Issued January 3, 1975. Derwent French Patents Report, Vol W, No 8, p 9, January, 1975.

Descriptors: *Toxicity, *Sewage, Waste water treatment, Analytical techniques, *Patents, *Microorganisms, Effluents, Liquid wastes, Measurement, Turbidity, *Bioindicators.

The toxicity of liquids in waste water and sewage may be determined by means of microorganisms. A patent was issued whereby these are continuously cultivated in a circulation recipient with a very concentrated nutritive medium and mixed with the dilution liquid. The mixture flows continuously into a small measuring recipient which is sealed against the inflow of air and has a magnetic stirrer, then leaves via an overflow. The oxygen content of the liquid is measured continuously by an oxygen electrode. The liquid to be analyzed is saturated with oxygen in a second recipient where it is simultaneously treated with the nutrient solution. The mixture flows into the recipient then mixes with the mixture from the first chamber; and the two flow out through the overflow. Alteration in the microorganisms due to the toxicity is determined by the measurement of one of the parameters such as turbidity or color changes, which are a function of the vital activities of the organisms. (Prague-FIRL)
W75-11431

SPECTROPHOTOMETRIC DETERMINATION OF FLUORINE IN WATER, (IN RUSSIAN).
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Chelyabinsk (USSR).
V. P. Ufimtseva, and L. F. Flejsher.
Gig Sanit, 3 p 72-73, 1974.

Descriptors: *Pollutant identification, *Spectrophotometry, Analytical techniques, *Fluorine, *Colorimetry, Chemical analysis, Water analysis.
Identifiers: Alizarin, Zirconium.

A method for spectrophotometric determination of fluorine (F) in surface and sewage waters is described. It is based on Scott's zirconium alizarin colorimetric method and its modification according to Meyer. The zirconium alizarin compound color is weakened by F in acid medium, and also a colorless more stable zirconium and F compound is formed. F content is determined by comparing photocolorimeter or spectrophotometer readings with a series of standard solutions. For 0.1-1.25 mg/l F concentrations, the values of the optical density range from 0.01-0.08. The method allows determination of higher concentrations of F, up to 3.5 mg/l. The error does not exceed 0.9-2.8%.--Copyright 1975, Biological Abstracts, Inc.
W75-11433

APPARATUS FOR PROVIDING A STATISTICAL COUNT OF PARTICULATE MATERIAL IN A FLUID,
Protron Associates, Palo Alto, Calif. (assignee).
H. M. Ogle.
United States Patent 3,858,851. Issued January 7, 1975. Official Gazette of the United States Patent Office, Vol 930, No 1, p 326, January, 1975. 1 fig.

Descriptors: *Patents, *Samples, *Suspended solids, Analytical techniques, Liquids, Statistical analysis, *Pollutant identification.
Identifiers: Particulate material, Light beams.

A method of measuring particulate material in a sample volume of particulate material suspended in a liquid was patented. The liquid is contained within a sealed transparent container. A liquid inspection apparatus consists of means for: generating a well-defined beam of light; directing the well-defined light beam through the container; and, scanning the light beam over at least one path located entirely within a confined area transverse to the direction of the light beam. This sequentially illuminates particulate material in the portion of liquid from which bursts of light are scattered. Additionally, means for detecting the scattered bursts of light produce a sequence of electrical signals. Means responsive to the electrical signals occurring within a selected interval of time provide a measure of the particulate material within the sample volume. (Prague-FIRL)
W75-11434

IS THE MALACHITE GREEN BROTH ACCORDING TO HABS AND KIRCHNER SUITABLE FOR SERVING AS AN ISOLATION MEDIUM FOR PSEUDOMONAS AERUGINOSA FROM WATER, (IN GERMAN),
Frankfurt Univ. (West Germany). Hygiene-Institut.
For primary bibliographic entry see Field 5B.
W75-11435

SPECTROPHOTOMETRIC DETERMINATION OF SUGARS IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analititicheskoi Khimii.
G. M. Varshal, N. K. Shcherbinina, and I. S. Sirotkina.
Gidrobiol Zh, Vol 10, No 1, p 94-98, 1974. Illus.

Descriptors: *Natural watercourses, *Analytical techniques, *Spectrophotometry, Chemicals, *Pollutant identification, Copper, Water pollution, Water analysis.
Identifiers: *Picramine-epsilon, *Sugars.

The proposed method of determining microquantities of sugars in natural waters is based on the selective and highly sensitive reaction of Cu using the reagent picramine-epsilon. Determination of sugars is possible without preliminary separation of the bulk of the concomittant components. The method is sensitive to 0.1 micro-g/sample. The method can be used for direct determination of sugars in waters with markedly different composi-

tions of inorganic and organic components and degrees of pollution.--Copyright 1975, Biological Abstracts, Inc.
W75-11437

REGIONAL CHEMISTRY OF GROUNDWATER IN THE WAINWRIGHT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W75-11471

WATER QUALITY REPORT: THE COLUMBIA RIVER BELOW LONGVIEW, WASHINGTON, DECEMBER 1971 - NOVEMBER 1972,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5B.
W75-11472

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 1. NORTH ATLANTIC SLOPE BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11479

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11480

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11481

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 6. MISSOURI RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11482

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 7. LOWER MISSISSIPPI RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11483

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 8. WESTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11484

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11485

GROUND-WATER DATA FOR BOLIVAR COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-11496

GROUND-WATER DATA IN THE HARRISBURG - HALSEY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 7C.
W75-11498

GROUND-WATER LEVELS IN LOUISIANA--FOR WELLS MEASURED THROUGH 1974.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W75-11499

BILIARY EXCRETION OF PHENYL AND METHYL MERCURY CHLORIDES AND THEIR ENTEROHEPATIC CIRCULATION IN RATS,
Institut Hygieny a Epidemiologie, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5C.
W75-11525

RADIOACTIVE - TRACER DISPLACEMENT METHOD FOR THE DETERMINATION OF SMALL QUANTITIES OF NICKEL,
Savannah State Coll., Ga. Dept. of Chemistry.
R. A. German, D. L. Hamilton, and M. P. Menon.
Analytical Chemistry, Vol 47, No 4, p 658-661, April, 1975. 2 fig, 4 tab, 12 ref.

Descriptors: *Nickel, *Heavy metals, *Pollutant identification, *Analytic techniques, Radioactivity, Neutron activation analysis.
Identifiers: *Interference studies, *Transition metals.

The displacement reaction between nickel and zinc ethylene-diaminetetraacetate labeled with Zn65 can be used to determine traces of nickel as low as 0.05 ppm in interference - free samples. This method is based on the extraction of radioactive zinc displaced by nickel from the zinc chelate which is labeled with 245-d Zn65 into a dithizone-carbon tetrachloride solution and the subsequent measurement of the activity of an aliquot of the extract. The transition metals do interfere with the analysis, but the interferences of many may be removed by suitable masking reagents. For the analysis of samples containing significant concentration of transition metals, nickel has to be separated by the dimethyl glyoxime method prior to the addition of the radioreactent. This method is more sensitive than most of the spectrophotometric methods as well as the neutron activation technique. (Delfiner-Vanderbilt)
W75-11526

QUANTITATIVE INORGANIC ANALYSIS BY GAS CHROMATROGRAPHY, A REVIEW,
Birmingham Univ. (England). Dept. of Chemistry.
J. A. Rodriguez-Vazquez.
Analytica Chimica Acta, Vol 73, No 1, p 1-32, November, 1974, 1 tab, 35 ref.

Descriptors: *Gas chromatography, *Heavy metals, *Metals, Analytical techniques, Ions, Anions, Cations, Thermal conductivity, Flame photometry, Mass spectrometry, Chelation, *Reviews, Pollutant identification.
Identifiers: *Quantitative inorganic analysis, Metal halides, Flame ionization, Electron capture, Mass balance, Beta-diketones, England.

This review of the literature on quantitative procedures for inorganic gas chromatography includes general remarks about gas chromatographic columns, detection systems, calibration techniques, quantitative gas chromatography with metal halides, determination of anions, trace analysis of beta-diketone chelates, miscellaneous methods for the determination of metals, and comparison with other techniques such as atomic absorption spectrometry, fluorescence spectromety. The detection of 31 different ionic species (including heavy metals, metals and nonmetals) is touched upon. (Delfiner-Vanderbilt)
W75-11528

UPTAKE, DISTRIBUTION AND FATE OF 203 HG-ETHYLMERCURIC CHLORIDE IN THE GUPPY AND THE COONTAIL,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 5C.
W75-11529

THE OCCURRENCE OF MERCURY IN AMPHIBIA,
Ljubljana Univ. (Yugoslavia). J. Steffan Inst.
A. R. Byrne, L. Kosta, and P. Stegnar.
Environmental Letters, Vol 8, No 2, p 147-155, 1975. 4 tab, 7 ref.

Descriptors: Aquatic environment, *Amphibians, *Mercury, Mine wastes, Neutron activation analysis, Gas chromatography, Trace elements, *Pollutant identification, Distribution.
Identifiers: *Methylmercury, Background levels, Muscle tissue, Mercury distribution.

Studies have been made of the distribution of mercury and its occurrence as methylmercury in the organs of amphibia collected from different sites mainly in Slovenia, Yugoslavia, including the area near the mercury mine at Idrija. Liver accumulates the highest amounts of mercury, up to 2 ppm in apparent background areas, with values up to 0.5 ppm in muscle, where virtually all mercury is present in the methyl form. Results are reported for some other trace elements in liver. Measurements were made of I, Br, As, Se, Cu, and Zn. The total mercury was determined by neutron activation analysis with volatilization separation of mercury from an irradiated sample. The other trace element concentrations were determined by the same method. Methylmercury was measured by gas chromatography after its isolation from the sample by a new technique. Amphibia may provide useful monitors of the occurrence and spread of mercury contamination. (Litoff-Vanderbilt)
W75-11534

ATOMIC-ABSORPTION SPECTROMETRIC DETERMINATION OF CADMIUM, LEAD, AND ZINC IN SALTS OR SALT SOLUTIONS BY HANGING MERCURY DROP ELECTRODEPOSITION AND ATOMIZATION IN A GRAPHITE FURNACE,
Oslo Univ. (Norway). Dept. of Chemistry.
F. O. Jensen, J. Dolezal, and F. J. Langmyhr.
Analytica Chemica Acta, Vol 72, No 2, p 245-250, Oct, 1974. 2 fig, 2 tab, 7 ref.

Descriptors: *Analytical techniques, *Heavy metals, Sea water, Electrolysis, Volumetric analysis, Spectrophotometry, Cadmium, Lead, Zinc, *Pollutant identification.
Identifiers: *Hanging mercury drop electrode, *Stripping voltammetry, Salt solutions.

Atomic absorption spectrometric methods are described for the determination of trace amounts of Cd, Pb, Zn in salts or salt solutions. The metals are separated from the salt matrix by electrolysis on a hanging mercury drop electrode, the mercury is transferred to a graphite boat and removed by evaporation, and the metals are determined by atomization. The feasibility of the technique was tested by analysis of sea water and of reagent-grade potassium chloride. For comparison the three metals were also determined in the sea water by stripping voltammetry; good agreement was found. (Delfiner-Vanderbilt)
W75-11536

A COMPARATIVE STUDY ON METHODS FOR CADMIUM ANALYSIS OF GRAIN WITH AN APPLICATION TO POLLUTION EVALUATION,
Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
T. Kjellstrom, B. Lind, L. Linnman, and G. Nordberg.

Environmental Research, Vol 8, No 1, p 92-106, August, 1974. 4 fig, 7 tab, 11 ref.

Descriptors: *Cadmium, *Heavy metals, *Analytical techniques, *Pollutant identification, *Spectrophotometry, *Grain(Crops), Radioactivity techniques, Neutron activation analysis, Colorimetry, Wheat, Oats, Barley.
Identifiers: Pollution evaluation, Atomic absorption spectrophotometry, Food stuffs, Dithizone colorimetric method, Sweden.

A study was performed to compare three variations of atomic absorption spectrophotometry (AAS): the conventional flame technique, the conventional technique involving ammonium-pyrrolidine extraction, and a flameless technique involving a heated graphite atomizer in the analysis of cadmium in wheat. Radioactive 109 Cd was utilized in order to study the losses in the various analytical procedures. The heated graphite atomizer method gave the best recovery (95%) and the smallest difference between duplicate samples. A comparison was also made between the atomic absorption methods and a neutron activation method, as well as a dithizone colorimetric method. The heated graphite atomizer method was used to study the cadmium concentration in wheat, oats, and barley in polluted and nonpolluted areas. Higher cadmium concentrations were found in the polluted areas. A discussion of obtained differences is given. (Delfiner-Vanderbilt)
W75-11539

CATALYTIC-COULOMETRIC DETERMINATION OF COPPER AT MICROGRAM AND NANOGRAM LEVELS,
Maryland Univ., College Park. Dept. of Chemistry.
C. D. McGlothlin, and W. C. Purdy.
Analytica Chimica Acta, Vol 73, No 1, p 216-219, November, 1974, 2 fig, 12 ref.

Descriptors: *Copper, *Analytical techniques, *Pollutant identification, *Volumetric analysis.
Identifiers: *Catalytic-coulmetric determination, Hydrogen peroxide, Calibratum curves.

The development of a coulometric procedure for copper, based on its activity in the decomposition of hydrogen peroxide is described. The procedure is useful for microgram and nanogram quantities of copper. Reactions are quite fast and proceed to completion in a few seconds. (Delfiner-Vanderbilt)
W75-11540

THE DETERMINATION OF TRACES OF LEAD (II) BY SOLID-STATE LUMINESCENCE,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
D. E. Ryan, J. Holzbecher, and H. Rollier.
Analytica Chimica Acta, Vol 73, No 1, p 49-52, November, 1974. 1 fig, 6 ref.

Descriptors: *Heavy metals, *Lead, *Chemical precipitation, *Fluorometry, Leaves, Analytical techniques, *Pollutant identifcation.
Identifiers: *Lead(II), Solid-state luminescence, Co-precipitation, Dry and wet ashing, Synthetic blood, Inorganic phosphorus, Para-magnetic metal ions, Biological materials, Traces of heavy metals, Extraction, Calcium oxalate.

A method is outlined for the determination of lead (II) in the range 5-2,000 ng per ml, after dissolution of practical samples, by co-precipitation with calcium oxalate and ignition at 850-900C to CaO:Pb phosphor, and measurement of its solid state luminescence at 530 nm. In this manner, trace quantities of lead were directly determined in leaves, after dry and wet ashing, and in synthetic blood. (Delfiner-Vanderbilt)
W75-11541

LOSS OF TRACE ELEMENTS FROM NATURAL WATER DURING STORAGE. I. BEHAVIOR OF 203 HG AND 65 ZN ADDED TO POND WATER,
Tokyo Univ. (Japan). Dept. of Agricultural Chemistry.
Y. Dokiya, S. Yamazaki, and K. Fuwa.
Environmental Letters, Vol 7, No 1, p 67-81, 1974. 7 fig, 3 tab, 8 ref.

Descriptors: Adsorption, *Spectroscopy, *Heavy metals, *Trace elements, *Standing waters, *Chemical properties, Stability, Ponds, *Pollutant identification.
Identifiers: *Atomic absorption spectroscopy, *203 Hg, *65 Zn, Biological Activity, Preservatives.

Dilute solutions (1 ppb-1 ppm) of inorganic mercury and zinc were prepared using distilled water and pond water, labelled with 203 Hg and 65 Zn. The rapid loss of 203 Hg at the level of ppb from distilled water is caused by adsorption to the surface of containers and vaporization to the atmosphere. In pond water some biological activity additionally participates in the loss. In 65 Zn solution, the biological activity alone is the main cause of loss from the solution. Some preservatives are examined. Among the preservatives examined, one millimole-cysteine seems to be the most satisfactory. The acids, long assumed as the most common preservatives, do not work against the vaporization of Hg. For the natural water, addition of 0.1 Normal HCl together with one millimole cysteine appears to be the best to preserve the ionic mercury as the microbes' growth is prevented at lower pH. The direct determination of mercury in natural water at the level of ppb was made by flameless atomic spectroscopy. (Litoff-Vanderbilt)
W75-11543

LEAD AND ARSENIC LEVELS OF DAIRY CATTLE IN PROXIMITY TO A COPPER SMELTER,
Washington Univ., Seattle. Dept. of Environmental Health.
R. M. Orheim, L. Lippman, C. J. Johnson, and H. H. Bovee.
Environmental Letters, Vol 7, No 3, p 229-236, 1974. 2 fig, 5 tab, 4 ref.

Descriptors: *Heavy metals, *Lead, *Spectrophotometry, *Arsenic compounds, Analytic techniques, *Cattle, *Copper, Milk, Soil analysis, Water pollution, *Pollutant identification, Air pollution, Washington.
Identifiers: *Atomic absorption spectrophotometry, Smelter, Refinery, *Puget sound(Wash), Blood, Hair, Dairy cattle, Delves cup modification.

Blood and milk from two groups of dairy cows were analyzed for lead and arsenic by atomic absorption spectrophotometry; hair samples from the same cows were analyzed for arsenic only. Those cows within 15 miles of the copper smelter showed a twenty fold increase of arsenic in hair over those more than 35 miles removed. The investigation took place on the eastern shoreline of the southern part of Puget Sound where a copper smelter and refinery are located. The ore that is refined contains large amounts of lead and arsenic. There are two inhabited islands two miles north of the smelter. The results indicated no health problems from drinking water or from dairy products, at least during the summer months. The soil and hair samples did show a build-up or storage of lead and arsenic in the fallout area. (Delfiner-Vanderbilt)
W75-11544

THE SOLUBILITY BEHAVIOUR OF NO. 2 FUEL OIL IN SEA WATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W75-11565

SUBMICROGRAM PER GRAM CONCENTRATIONS OF MERCURY IN ORCHARD LEAVES DETERMINED BY ISOTOPE DILUTION AND SPARK-SOURCE MASS SPECTROMETRY,
National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
R. Alvarez.
Analytica Chimica Acta, Vol 73, No 1, p 33-38, 1974, 1 fig, 2 tab, 11 ref.

Descriptors: *Heavy metals, *Mercury, *Analytical techniques, *Leaves, *Isotope studies, *Mass spectrometry, Electrolysis, *Pollutant identification.
Identifiers: Orchard leaves, Isotope dilution, Spark source mass spectrometry, Sub-microgram concentrations, Wet ashing, Microphotometers.

A method was developed for determining submicrogram per gram concentrations of mercury in orchard leaves by use of a stable isotope dilution procedure in conjunction with the spark source mass spectrograph. A 5 gram sample was spiked with a solution of mercury, isotopically enriched in 201 Hg and 198 Hg. The 198 Hg served as a carrier. After wet-ashing the sample with nitric and perchloric acids under reflux and distilling most of the acid, the isotopically equilibrated mercury was electrodeposited onto high-purity gold wires for sparking in the mass spectrograph. The concentration was calculated from the altered isotope ratio, 201 Hg/202 Hg, and other data. The results were compared with those obtained by atomic absorption spectrometry and neutron activation, leading to a certified value of 0.155 plus or minus 0.015 microgram per gram for the mercury content of orchard leaves, SRM 1571 of the National Bureau of Standards. (Delfiner-Vanderbilt)
W75-11581

HIGH COPPER CONCENTRATIONS IN SQUID LIVERS IN ASSOCIATION WITH ELEVATED LEVELS OF SILVER, CADMIUM AND ZINC,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W75-11609

THE ESTIMATION OF THE AMOUNT OF EMPIRE MIX CRUDE OIL IN MULLET, SHRIMP, AND OYSTERS BY LIQUID CHROMATOGRAPHY,
Mississippi State Univ., Mississippi State. Dept. of Chemistry.
D. H. Miles, M. J. Coign, and L. R. Brown.
In: 1975 Conference on Prevention and Control of Oil Pollution Proceedings; American Petroleum Institute, EPA and U.S. Coast Guard, March 1975, p 149-154, 5 fig, 2 tab, 26 ref.

Descriptors: *Chromatography, Gas chromatography, *Oil pollution, Methodology, *Analytical techniques, *Bioassay, *Mullets, *Shrimp, *Oysters, Aquatic life, Animal physiology, *Pollutant identification.
Identifiers: Liquid chromatography, Empire mix crude oil, Tissue analysis, Bioaccumulation, Comparative techniques.

A method for rapidly estimating the amount of oil taken up by small (0.1g) samples of specific tissues from mullet, shrimp and oysters which were exposed to empire mix crude oil under controlled laboratory conditions was presented. The results obtained by utilizing the liquid chromatographic (LC) method described were compared to results obtained using conventional gas chromatographic (GC) techniques. Either method was valid for large samples of tissues. Data from routine bioassay experiments showed that 50% of the samples of shrimp tissue, 23% of the mullet tissue samples, and 49% of the oyster tissue showed the presence of oil only by the LC method. The LC method also afforded a greater amount of replications and conduction of multiple analyses on a given tissue. (Katz)
W75-11613

HYDROCARBONS ASSOCIATED WITH SUSPENDED PARTICULATE MATTER IN SAN FRANCISCO BAY WATERS,
Naval Biomedical Research Lab., Oakland, Calif.
L. H. DiSalvo, and H. E. Guard.
In: 1975 Conference on Prevention and Control of Oil Pollution Proceedings; American Petroleum Institute, EPA and U.S. Coast Guard, March 1975, p 169-173. 2 fig, 5 tab, 19 ref.

Descriptors: *Mussels, *Oil pollution, *Suspended solids, *Suspended load, *Sampling, *Organic compounds, *Water sampling, *Methodology, Chromatography, Sediments, Water pollution sources, Summer, *California.
Identifiers: *Bay mussels, *Mytilus edulis, Double settling tube, Biosamples, *San Francisco Bay(Calif), Thin-layer chromatography, Biological agents.

Suspended sediments were obtained at seven stations in San Francisco Bay during the summer of 1974 using a double settling tube. Bay mussels Mytilus edulis were used as biological agents for the active entrapment and deposition of suspended particulates occurring in the water. Total alkane and aromatic hydrocarbons were determined in the recovered sediments. Calculations suggested that 13.5 or more tons of presumably pollutant hydrocarbons were present in association with suspended particulate matter in the bay system at any given time during the sampling period. (Katz)
W75-11614

KINETICS OF THE FLUORINATION OF ZINC,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
P. M. O'Donnell.
Available from the National Technical Information Service, Springfield, Va 22161 as NASA-TND-7931, $3.25 in paper copy, $2.25 in microfiche. NASA TN D-7931, March 1975. 13 p, 8 fig, 1 tab, 12 ref.

Descriptors: *Zinc, *Fluorine, *Halogens, *Kinetics, *Thermodynamics, Inorganic compounds, Temperature, Physical properties, Pressure, Analysis, Fluorides, Halides, Fluoridation, Salts, Properties, Thermal properties, Metals, Rates, Microscopy, X-ray analysis, Chemical reactions.
Identifiers: *Fluorination reactions, *Zinc fluoride, Fluorination apparatus, Rate constants, Parabolic rate constant, Zinc vaporization, Vaporization reactions, Pressure sensitive, Temperature sensitive.

The reaction between zinc metal and fluorine gas was studied over the temperature range of 100 to 400 degrees C and at pressures from 6 to 83 kilonewtons per square meter. At all temperatures and pressures the rate followed a parabolic equation. The parabolic rate constant was markedly pressure dependent. Above 300 degrees C, simple kinetics were complicated by zinc vaporization. At low temperatures an activation energy of 11.7 kilojoules per mole was calculated; however, a break was observed in the Arrhenius plot at about 300 degrees C. There was a clear change in the nature of the temperature dependence due to a change in mechanism between the low temperature region and the high temperature region. (Henley-ISWS)
W75-11629

THE CONTINUOUS MONITORING OF WATER QUALITY,
Clyde River Purification Board, Glasgow (Scotland).
G. A. Best.
The Public Health Engineer, No 15, p 73-84, May 1975. 9 fig, 6 tab, 11 ref.

Descriptors: *Water quality, *Monitoring, *Warning systems, *Water supply, Bodies of water, Dissolved oxygen, Suspended solids, Phenols, Oil, Metals, Pesticides, Installation costs, Biodegradation, Decomposing organic matter, Potable water.
Identifiers: Clyde River(Gt. Brit), Biodegradable organic matter, Cyanide.

The Clyde River Purification Board recently installed two continuous water quality monitors to assess changes and to provide warning when water supply is unsuitable for potable use. The two stations were built at Glasgow Green on the lowest reach of the River Clyde and at Orbiston Park, just upstream of a proposed lake. Installation costs were high, and the stations require regular maintenance by a technician with some knowledge of electronics. Three additional stations have not been built because the Board feels that the available monitoring equipment is not reliable enough. Accurate long-term measurements can be made of dissolved oxygen, suspended solids, pH, conductivity, and temperature. However, better sensors are needed for measuring biodegradable organic matter, phenols, oil, cyanide, metals, and pesticides. Such monitoring stations are useful when they are connected directly to the headquarters' laboratory, so that immediate warnings may be given in cases of water quality deterioration. (Kramer-FIRL)
W75-11667

REPORT OF ANALYSES FOR INDUSTRIAL WASTE WATER IN TWENTY-EIGHT FACTORIES, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
Y. Asada, T. Masaki, Y. Takamura, S. Shirasaka, and M. Kubota.
Sci Rep Fac Agric Ibaraki Univ, 21 p 65-74, 1973. Illus.

Descriptors: *Industrial wastes, *Japan, *Water pollution sources, Industrial water, Waste water, *Water quality standards, *Analysis, Coliforms, Bacteria, Chemical oxygen demand, Suspended solids, Alkalinity, Phenols, *Industrial plants, Food processing industry, Chemical wastes, Urban drainage, Nitrogen, Cement goods factories, Metal products plants.

Factories (28) were classified into 3 categories: factories of hard ware (metal goods), of food goods, of cement goods and others. To determine whether industrial waste water fulfilled the water quality standards of Tsuchiura city (Japan), analytical experiments were carried out from April 1972-April 1973 for: pH, chemical oxygen demand (COD), suspended solids (SS), phenol, alkalinity, NH4+-N, NO+2-N, Cl-, CN-, Cu2+, Pb2+, Fe3+, Mn2+, Cd2+, Cr6+, ions, total Cr and number of coliform bacteria. Excessive CN-, Zn2+, Cr6+, OH- ions and SS were often in the drainage from some metal product plants. Excess number of coliform bacteria, COD and SS were in the industrial waste water from food product plants. Cr6+ ion was detected in samples from cement goods factories. River pollution was caused mainly by industrial waste waters from metal product plants and food product plants, and urban sewage drainage.--Copyright 1975, Biological Abstracts, Inc.
W75-11671

CONTINUOUS MONITORING, AUTOMATED ANALYSIS AND SAMPLING PROCEDURES, (LITERATURE REVIEW),
Florida Univ., Gainesville.
P. L. Brezonik.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1241-1249, June, 1975. 92 ref.

Descriptors: *Automation, *Sampling, *Monitoring, *Water quality, Inorganic compounds, Effluents, Water, Sea water, *Reviews, Bibliographies.
Identifiers: Organic pollutants, Autoanalyzers, Rainfall collection, Oil extraction.

Recent literature on continuous monitoring, automated analysis, and sampling procedures for water quality was reviewed. Inorganic substances may be measured by electrometric methods such as ion-selective electrodes for continuous monitoring of water and wastes. Autoanalyzers and modifications of these were discussed in terms of spectrometry procedures. Additionally, oxygen demand, organic matter, and bioassays were described. River and effluent sampling programs need to define objectives in order to optimize cost-effectiveness. Preservation of samples may be achieved chemically; several storage solution formulae are given. Samplers for rainfall collection and for oil extraction are also being developed. Also, concentration-extraction methods are being used to measure organic pollutants in natural waters as well as to analyze mercury levels in seawater. (Kramer-FIRL)
W75-11711

COPPER AND ZINC IN CANCER IRRORATUS: COMPARATIVE METABOLISM OF THE MOLT CYCLE, LE CUIVRE ET LE ZINC CHEZ CANCER IRRORATUS (CRUSTACE:DECAPODE): METABOLISME COMPARE AU COURS DU CYCLE D'INTERMUE,
CEA Centre de la Hague, Cherbourg (France). Laboratoire de Radioecologie Marine.
For primary bibliographic entry see Field 5C.
W75-11752

POLLUTION DETECTION AND RIVER QUALITY MANAGEMENT,
G. M. Woodward.
Water Treatment and Examination, Vol 24, Part 1, p 3-22, 1975. 2 tab, 8 ref.

Descriptors: *Pollutant identification, Water pollution effects, Water pollution control, Water pollution sources, *Water quality, Water management(Applied), *Rivers, *Estuaries, Surface waters, *Groundwater, Environmental effects.
Identifiers: *United Kingdom.

Various aspects of the detection and measurement of pollution in surface waters, groundwater and estuaries in relation to water quality management in the United Kingdom were discussed. Short and long term water pollution effects, remedial measures and water quality improvement actions were also discussed in the continuing effort to detect and monitor pollution. (Katz)
W75-11753

A METHOD FOR INTERMITTENT CHLORINE DOSING IN CONTINUOUS-FLOW TOXICITY TESTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
B. C. Gregg, and A. G. Heath.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 5, p 588-592, May 1975. 2 fig, 1 tab, 5 ref.

Descriptors: *Design, Construction, *Toxicity, *Methodology, *Chlorine, Waste water, Water pollution sources, Pollutant identification.
Identifiers: *Intermittent dosing, *Continuous-flow through tests, Steam electric generating plants.

The composition and operation of an intermittent delivery system used to perform chlorine toxicity tests on macroinvertebrates were described. This system was used to simulate the conditions downstream from electric (steam) generating plants which discharged a chlorine solution for treating organisms attached to cooling lines. (Katz)
W75-11754

MERCURY LEVELS IN FISH IN THE LA GRANDE RIVER AREA, NORTHERN QUEBEC,
McGill Univ., Montreal (Quebec).
E. C. Smith, F. Berkes, and J. A. Spence.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 6, p 673-677, June 1975. 1 tab, 7 ref.

Descriptors: *Pollutant identification, *Mercury, *Pikes, *Salmonids, *Lake trout, *Brook trout, *Baseline studies, Water quality standards, Analytical techniques, Laboratory studies, *Canada.
Identifiers: *Tissue analysis, Bioaccumulation, Northern pike, Esox lucius, Lake trout, Salvelinus namaycush, Yellow walleye, Stizostedion v vitreum, Brook trout, Salvelinus fontinalis, Lake Whitefish, Coregonus clupeaformis.

Natural background levels of mercury in an uncontaminated environment were determined for future baseline establishment and assessment of industrial pollution. Highest levels of mercury concentrations in the muscle tissue of various fish from the La Grande area are: one northern pike (Esox lucius) and one lake trout (Salvelinus namaycush) 1.21 ppm; one yellow walleye (Stizostedion v. vitreum) 0.78 ppm. Arithmetical means for pike and lake trout were 0.65 and 0.60 ppm respectively; brook trout (Salvelinus fontinalis) averaged 0.25 ppm and lake white fish (Coregonus clupeaformis) 0.16-0.09 ppm. (Katz)
W75-11756

THE BROWN PELICAN AND CERTAIN ENVIRONMENTAL POLLUTANTS IN LOUISIANA,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
L. J. Blus, T. Joanen, A. A. Belisle, and R. M. Prouty.
Bulletin of Environmental Contamination and Toxicity, Vol 13, No 6, p 646-655, June 1975. 1 fig, 4 tab, 23 ref.

Descriptors: *Metals, *Metabolism, *Organic compounds, *Birds, *Nests, *Growth stages, *Chlorinated hydrocarbons, On-site investigations, Laboratory tests, Mercury, Zinc, Copper, Cadmium, Lead, Nickel, Environmental effects, *Louisiana, *Polychlorinated biphenyls, *Pollutant identification.
Identifiers: *Pelicans, *Eastern Brown Pelican, Pelecanus occidentalis, PCB, Polychlorinated biphenyls.

Collecting eggs, counting nests and young, and transplanting the young were involved in the field study of the eastern brown pelican (Pelecanus occidentalis) in Louisiana. Thirty-six eggs were analyzed for organochlorine pesticide residues, eggshell thickness, metabolism, and polychlorinated biphenyls (PCB's). Mercury, zinc, copper, cadmium, lead and nickel levels were determined. (Katz)
W75-11757

STUDIES OF THE AROMATIC COMPOUNDS CONTENT IN SEA WATER BY LOW-TEMPERATURE LUMINESCENT SPECTROSCOPY, (IN RUSSIAN),
Vysshee Inzheneroe Morskoe Uchilishche, Odessa (USSR).
Yu. R. Red'kin, A. M. Voitenko, and P. A. Teplyakov.
Okeanologiya, Vol 13, No 5, p 908-913, 1973. Illus.

Descriptors: *Sew water, *Coasts, Oceans, *Water pollution sources, *Aromatic compounds, *Organic compounds, *Analytical techniques, *Spectroscopy, *Bottom sediments, Sediments, Fish, Pollutant identification.
Identifiers: *Black Sea, *Luminescent spectroscopy, Hydro carbons, Polynuclear aromatic hydrocarbons, PAH, Shpolsky's effect, Chromatographic fractionation, *Tissue(Animal), USSR.

Pollution of the Coastal water of the Black Sea with polynuclear aromatic hydrocarbons (PAH) was studied using the fine-structure liminescent spectroscopy method based on Shpolsky's effect at the temperature of liquid nitrogen (77K) with previous chromatographic fractionation. Fluorescent and phosphoresent methods were developed for quantitative determination of PAH in sea water, bottom sediments and animal (fish) tissue with photoelectric and photographic recording of the spectrum for the straight-chain paraffins (acenapthene: 321 nm and 478.4 nm; phenanthrene: 345.7 nm and 463 nm; 3,4-benzpyrene: 403 nm; fluoranthene: 407.8 nm). Measures are proposed for preventing pollution of the sea with hydrocarbons.--Copyright 1975, Biological Abstracts, Inc.
W75-11786

METHODS OF DETECTING THE FLUORINE ION IN AIR AND WATER, (IN RUSSIAN),
G. S. Salyamon, and M. V. Popelkovskaya.
Gig Sanit, Vol 38, No 4, p 65-67, 1973.

Descriptors: *Chemical analysis, *Air pollution, Water, *Fluorine, Fluorides, *Analytical techniques, *Pollutant identification, Cesium.
Identifiers: Alizarin, Cyanine, Eriochrome, Sulfonic-acid, Sulfophenylazo-1, Zirconium, Chelating agents.

To select the most sensitive and specific methods for analyzing HF and fluorides in air and water, 16 methods recommended for this purpose and 9 for determination of the F ion in other media (solutions, biomaterials, etc.) were tested. From these 25 methods, 3 were selected: using Zr-ECC (Zr-eriochromcyanine), Zr-SPADNS (Zr complex of 4-sulfophenylazol1,18-dihydroxynaphthalene-31,61-disulfonic acid), and Ce-alizarin chelating agent. The first 2 methods have advantages with respect to the range of determination and simplicity of reagent preparation. All 3 indicators react selectively with F- in the presence of 10 to the 2nd power-10 to the 4th power microgram of many substances. Zr-SPADNS should be used primarily for analyzing HF and fluorides in the atmosphere and air of work zones, bodies of water and waste waters, without the separation of F- from admixtures in many cases. The other 2 methods, Ce-alizarin chelating agent and Zr-ECC, are recommended for analyzing air and bodies of water but not waste waters.--Copyright 1975, Biological Abstracts, Inc.
W75-11794

THE BEHAVIOUR OF METAL TETRAMETHYLENEDITHIOCARBAMATES IN THE GRAPHITE-TUBE FURNACE FOR ATOMIC ABSORPTION SPECTROMETRY,
Ljubljana Univ. (Yugoslavia). Inst. of Chemistry.
S. Gomiscek, Z. Lengar, J. Cernetic, and V. Hudnik.
Analytics Chimica Acta, Vol 73, No 1, p 97-106, November, 1974, 7 fig, 3 tab, 12 ref.

Descriptors: *Heavy metals, *Chelation, *Spectrophotometry, *Chemical analysis, Cadmium, Cobalt, Copper, Iron, Nickel, Lead, Vanadium, Argon, Oxygen, *Pollutant identification, Separation techniques.
Identifiers: *Atomic absorption spectroscopy, Graphite tube furnace, *Metal chelates, *Metal carbamates, Organic reagents, Atomization, Oxidative decomposition, Metal tetramethylenedithio carbamates.

Some phenomena occurring during the atomization of metal tetramethylenedithiocarbamates (MeTMDTC) in the graphite tube furnace were observed. Explanations based on studies of the behavior of MeTMDTC in argon and oxygen at higher temperatures and on the results of x-ray diffraction, differential thermal and thermogravimetric studies were proposed. The metals used were Cd, Co, Cu, Fe, Ni, Pb, and V. Curves show the dependence of the absorption peaks on the destruction temperature. These curves are characterized by tendencies toward decreased absorption signals for temperatures of 60C and 100C and by the relative constancy of the signals for destruction for temperatures from 200C to 1100C. Cadmium and lead TMDTC deviate from this behavior. (Delfiner-Vanderbilt)
W75-11797

THE DETERMINATION OF CADMIUM IN SEA WATER BY RADIOACTIVATION,
Naval Undersea Center, San Diego, Calif.
H. V. Weiss, K. Chew, M. Guthman, and A. Host.
Analytica Chimica Acta, Vol 73, No 1, p 173-176, November, 1974, 1 fig, 1 tab, 2 ref.

Descriptors: *Cadmium, *Cadmium radioisotopes, *Heavy metals, *Neutron activation analysis, *Crystallization, Assay, Separation techniques, Analytical techniques, Neutron absorption, Mercury, *Pollutant identification.
Identifiers: Beta-ray activity, Indium, Oxine, 8-hydroxyquinoline.

A method is described of isolating cadmium from sea water by co-crystallization with 8-hydroxyquinoline (oxine). The technique involved neutron activation analysis. Beta-ray activity measurements were made of 115 Cd-115In. Results of the assay of cadium in two different volumes of stock sea water are as follows. Eight analyses of 0.5 liter samples and five of 1 liter samples averaged 0.737 plus or minus 0.041 and 1.451 plus or minus 0.044 micrograms, respectively. The overall standard deviation is 4.7%. The determination of mercury in sea water is inherently compatible with the analytical scheme described. (Delfiner-Vanderbilt)
W75-11798

5B. Sources Of Pollution

SANITARY AND BACTERIOLOGICAL EVALUATION OF THE RAW MATERIAL, AIR AND WASTEWATERS OF SOME BAST FIBER PLANTS IN THE UZBEK SSR, (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
M. S. Artykov, and N. P. Masharipov.
Gig Sanit, 4 p 101-102, 1974.

Descriptors: *Fibers(Plant), Industrial wastes, Waste water, Pollutants, *Water pollution sources, *Microorganisms, Bacteria, Aerobic bacteria, *Streptococchus, USSR, Public health, *Air pollution.
Identifiers: *Ambari, *Bast, Hibiscus-cannabinus, Kenaf, Occupational disease, Staphylococcus, Uzbek-SSR.

The Uzbek SSR ranks 1st in the USSR in the cultivation and production of ambari (kenaf, Hibiscus cannabinus). The bacterial contamination of industrial wastewaters, raw materials, air of shops, and washings from the upper air passages of workers at 2 bast fiber plants in the Tashkent region producing ambari was studied. The air at 1 plant contained 40 pathogenic strains of Staphylococcus and Streptococcus and at the other plant, 58 strains in 1 m to the third power; in the raw material, 43 and 15 strains were isolated, respectively. Bacterial contamination of the upper air passages by pathogenic microflora was higher at 1 plant than the other.--Copyright 1975, Biological Abstracts, Inc.
W75-11406

SANITARY AND HYGIENIC EVALUATION OF SEEPAGE WATERS OF STRUCTURES PROTECTING RESERVOIRS (IN RUSSIAN),
Gorkovskii Meditsinskii Institut (USSR).
T. S. Yurasova.
Gig Sanit. 4. p 96-97, 1974.

Descriptors: *Potable water, *Reservoirs, *Drainage systems, *Seepage, Analysis, *Water pollution sources, Filtration, Filters, Soil filters, Screens, Structures, Hydraulic structures, Barriers, Reservoir leakage, Reservoir construction, Bacteria, Sanitary engineering, Public health.

The drainage systems of a number of hydro developments discharge a considerable amount of seepage waters into reservoirs which supply the drinking water of cities. A sanitary and hygienic evaluation of seepage waters at the Gorki reservoir (USSR) showed that seepage waters can be used for drinking. However, the chemical composition and bacterial indices of seepage waters depend not only on the composition and quality of the groundwaters, filtering soils and filters of protective structures, but also on the sanitary state of the territory surrounding them. Low quality seepage waters were observed in cases of polluted surrounding territory.--Copyright 1975, Biological Abstracts, Inc.
W75-11412

STORM AND COMBINED SEWER ABATEMENT TECHNOLOGY IN THE UNITED STATES--AN OVERVIEW,
Environmental Protection Agency, Washington, D.C. Municipal Pollution Control Div.
For primary bibliographic entry see Field 5D.
W75-11414

A CASE OF SUBTERRANEAN WATER POLLUTION CAUSED BY THE PUBLIC REFUSE DISPOSAL GROUND, (IN JAPANESE),
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
T. Nishi, S. Miyagacho, Y. Sugiura, K. Shibamori, and S. Sawajiri.
Res Bull Obihiro Zootech Univ Ser I, Vol 8, No 3, p 345-353, 1974. Illus.

Descriptors: *Water pollution sources, *Subsurface waters, *Waste dumps, *Garbage dumps, Asia, Pollutant identification, Sampling, Rural areas, Municipal wastes, *Domestic wastes, Coliforms, Nitrogen compounds, Iron, Wells, Water wells, Ammonia, Nitrites.
Identifiers: *Japan(Obihiro City).

In Aug., 1969, in 1 area in Obihiro City, the well water of 5 farm houses (No. 1, 2, 3, 4 and 5) was polluted, and the polluting source was suspected to be the public refuse disposal area which was 550 m from the nearest house. To determine any connection, 2 driven pump wells were prepared at distances of approximately 10 m (No. 6) and 500 m (No 7) in the intermediate zone. As a control, 2 normal wells nearby (No. 8 and 9) and 3 surface water river samples (No. 10, 11 and 12) were tested. These 12 water samples were collected and tested, covering about 24 items. The main causes of the unsuitableness for drinking were combinations of high coliform count, high content of iron, and concurrent detection of nitrogen of ammonia and nitrite. The degree of pollution of the examined wells was in order: No. 7, No. 4, and No. 1, corresponding to their distance from the refuse disposal area to the downstream. In each of the examined items of pollution, high values were noted at the 500 m point (No. 7) than at the 10 m point (No. 6) in both of the experimentally driven pump wells. The pollution spread along the underground water vein as bed water.--Copyright 1975, Biological Abstracts, Inc.
W75-11432

IS THE MALACHITE GREEN BROTH ACCORDING TO HABS AND KIRCHNER SUITABLE FOR SERVING AS AN ISOLATION MEDIUM FOR PSEUDOMONAS AERUGINOSA FROM WATER, (IN GERMAN),
Frankfurt Univ. (West Germany). Hygiene-Institut.
R. Schubert, and U. Blum.
Zentralbl Bakteriol Parasitenkd Infektonskr Hyg Erste Abt Orig Reihe B Hyg Praev Med, Vol 158, No 6, p 583-587, 1974.

Descriptors: *Analytical techniques, *Pollutant identification, Water pollution sources, *Cultures, Plant tissues, *Pseudomonas, *Bacteria, Aerobic bacteria, Microorganisms.
Identifiers: Isolation, Malachite green, Mediums, *Pseudomonas-aeruginosa, Culture mediums.

The addition of malachite green (1:100000) to the culture medium is a simple and efficient method for the isolation of P. aeruginosa from the water. In the case of 6 P. aeruginosa strains the addition of malachite green did not decrease initial growth rate. The other Pseudomonas species normally occurring in the water are to a great extent inhibited in their growth following the addition of malachite green.--Copyright 1975, Biological Abstracts, Inc.
W75-11435

SOME PROBLEMS OF THE CIRCULATION OF ENTEROVIRUSES IN ENVIRONMENTAL OBJECTS, (IN RUSSIAN),
Kuybyshevskii Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny (USSR).
E. V. Rabyshko.
Gig Sanit, 4 p 105-106, 1974.

Descriptors: Pollution, Water pollution, *Water pollution sources, Water treatment, *Viruses, Waste water treatment, Waste treatment.
Identifiers: *Enteroviruses, Picornaviruses.

Enteroviruses were found in water with different degrees of contamination in many cases: in wastewaters in 40.7% of the samples (222 strains of enteroviruses), in river water in 14.9% of the samples (59 strains) and in tap water in 9 of 64 samples (12 strains). The presence of enteroviruses in these waters indicated that they pass through the barriers of treatment plants and are resistant to the decontamination regimes used.--Copyright 1975, Biological Abstracts, Inc.
W75-11438

PHYSICOCHEMICAL PROPERTIES OF DREDGE SPOIL,
Canada Centre for Inland Waters, Burlington (Ontario).
A. Mudroch, and A. J. Zeman.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW2, Proceedings Paper 11317, p 201-216, May 1975. 10 fig, 7 tab, 22 ref, 2 append.

Descriptors: *Cation exchange, *Dredging, *Harbors, *X-ray diffraction, *Physicochemical properties, *Great Lakes, *Lake Erie, *Lake Ontario, Plasticity, Spoil banks, Sediment load, Infrared radiation, Electron microscopy, Mineralogy, Sediments, Retention.
Identifiers: Citrates, Dredges, Mineral content, Infrared absorption, Postglacial sediments, Clycol.

Physicochemical changes resulting from the subaerial exposure of dredge spoil during land disposal were investigated using 5 fine-grain bottom sediment samples from the lower Great Lakes. Air-drying of unoxidized postglacial sediments increased cation exchange capacity and decreased plasticity. Air-drying of a Pleistocene oxidized sediment did not affect these parameters appreciably. The difference was attributed to an irreversible collapse of weathered swelling minerals and the oxidation of ferrous and manganous ions in postglacial sediments. Mineralogical composition and changes caused by citrate-dithionite extraction were examined by X-ray diffraction, infrared absorption, electron-optical, and surface area measurements. (Roberts-ISWS)
W75-11465

TRANSPORT MODEL, USER'S MANUAL,
Battelle-Pacific Northwest Labs., Richland, Wash. Water and Land Resources Dept.
S. W. Ahlstrom, and R. G. Baca.
Battelle Report, Number BNWL-1716, UC-70, 1974. 114 p, 3 fig, 5 append. ERDA Contract AT(45-1):1830.

Descriptors: *Path of pollutants, *Groundwater, *Computer models, *Water quality, *Chemical reactions, *Ion exchange, Dispersion, Diffusion, Groundwater movement, Digital computers, Aquifers, Model studies, *Computer programs, Mathematical models, Convection.
Identifiers: Method of characteristics, Particle-in-a-cell method, User's manual, *Transport models.

The numerical solution of the Transport Model equation is based on the technique known as the 'particle-in-a-cell' method. The numerical algorithm is contained in three main programs, TRACK, MICRO, and MACRO. The execution of program TRACK established the desired problem size, boundaries, and grid networks, and computes a movement history for the computational particles. A numerical solution to the micro ion transport equation is provided by the execution of program MICRO. Program MACRO calculates a numerical solution to the macro ion transport equation. (Prickett-ISWS)
W75-11468

SCALE EFFECTS ON COOLING TOWER MODEL STUDIES,
Iowa Inst. of Hydraulic Research, Iowa City.
For primary bibliographic entry see Field 8B.
W75-11470

WATER QUALITY REPORT: THE COLUMBIA RIVER BELOW LONGVIEW, WASHINGTON, DECEMBER 1971 - NOVEMBER 1972,
Washington State Dept. of Ecology, Olympia.
P. Lee.
Technical Report No 74-7, February 1974. 45 p, 3 fig, 11 tab, 8 ref, 6 append.

Descriptors: *Water quality, *Data collections, *Columbia River, *Washington, Water pollution, Water pollution sources, Pollutants, Coliforms, Water temperature, Dissolved oxygen, Municipal wastes, Pulp wastes, Discharge(Water), Sampling, Water analysis, Water quality standards.
Identifiers: *Longview.

The Washington State Department of Ecology collected water quality data from the Columbia River at a point 12 miles below Longview, Washington (at Port Westward, Oregon) from December 1971 to November 1972. The data were collected by a continuously operating automatic water quality data acquisition system. The Columbia River at this point is designated by Washington State Water Quality Standards as Class A waters. The river exceeded maximum allowable coliform standards during most of the year. During the low flow period in late summer and early fall, the river sporadically did not meet water quality standards for temperature and dissolved oxygen. The Columbia River was also monitored for dissolved oxygen and temperature by the National Marine Fisheries Service near Prescott, Oregon, about 6 miles upstream from Longview. No apparent water quality violations were observed during the year at this location. It was concluded that the industrial and municipal discharges in the Longview-Kelso area significantly contribute to the apparent water quality violations recorded at Port Westward. These conclusions support the results obtained by the U.S. Environmental Protection Agency in 1970 and 1971 on water quality conditions in the lower Columbia River. (Robinson-ISWS)
W75-11472

SELENIUM IN WATERS IN AND ADJACENT TO THE KENDRICK PROJECT, NATRONA COUNTY, WYOMING,
Geological Survey, Reston, Va.
M. A. Crist.
Available from Supt of Documents, GPO, Washington, DC 20402 $2.85. Water-Supply Paper 2023, 1974. 39 p, 3 fig, 3 plate, 3 tab, 17 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Groundwater, *Surface waters, *Wyoming, Inorganic compounds, Hydrogeology, Water chemistry, Geochemistry, Rocks, Chemical properties, Water wells, Sampling, Chemical analysis, Geologic time.
Identifiers: *Selenium, *Natrona County(Wyo).

Selenium in concentrations exceeding the maximum limit, 0.01 milligrams per liter or 10 micrograms per liter, recommended by the U.S. Public Health Service in 'Drinking-Water Standards, 1962,' is present in waters in areas near Casper, Wyo. Some streams containing selenium flow into the North Platte River upstream from several municipalities that obtain water from the river and the alluvium along the river. The area of investigation includes about 725 square miles in Natrona County in central Wyoming. Geologic formations in the area contain selenium that may have been derived from deposits of seleniferous material or from volcanic emanations brought down by rain. The selenium concentration in 82 samples of Cretaceous rocks ranged from less than 10 to 4,200 micrograms per kilogram. Of four samples of Tertiary rocks analyzed, three contained no selenium and one had a selenium concentration of 40 micrograms/kg. The selenium concentration in 93 samples of Quaternary rocks ranged from less than 10 to 520 micrograms/kg. The selenium concentration in the groundwater in these areas have not reached a state of equilibrium in the aquifer. Irrigation undoubtedly has accelerated movement of selenium within and from irrigated areas. (Woodard-USGS)
W75-11492

GEOHYDROLOGIC RECONNAISSANCE OF THE UPPER POTOMAC RIVER BASIN,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-11493

WATER QUALITY CHANGES RELATED TO THE DEVELOPMENT OF ANAEROBIC CONDITIONS DURING ARTIFICIAL RECHARGE,
Geological Survey, Lubbock, Tex.
W. W. Wood, and R. L. Bassett.
Water Resources Research, Vol 11, No 4, p 553-558, August 1975. 6 fig, 3 tab, 15 ref.

Descriptors: *Artificial recharge, *Water spreading, *Chemical reactions, *Anaerobic bacteria, *Texas, Groundwater recharge, *Water quality, Infiltration rates, Gravitational water, Soil properties, Sulfates, Bicarbonates, Hydrogen ion concentration, Geology, Data collections, Chemical analysis, *Water reuse.
Identifiers: *Lubbock(Tex).

Artificial recharge basins or spreading sites commonly exhibit reductions in infiltration rates after prolonged periods of submergence. This loss in infiltration rate has often been shown to be associated with a large population of anaerobic or facultative anaerobic bacteria in the material underlying the basin floor. An artificial recharge experiment in a spreading basin at Lubbock, Texas, showed a significant change in the chemical quality of recharged water that was associated with the growth of anaerobic bacteria. Sulfate-reducing bacteria reduced the sulfate concentration of the recharge water at this location by 80 mg/liter. The bicarbonate concentration was increased by more than 150 mg/liter, and the pH decreased 1 unit during the same time period. The change in chemical quality occurred suddenly and corresponded to a dramatic decrease in the infiltration rate in the basin. These observations on the chemical changes in recharged water make it possible to differentiate between anaerobic bacteria and other causes of reduced hydraulic conductivity in this recharge basin. The anaerobic conditions appear to start at depth and work toward the surface, thereby suggesting a process that involves adsorption of organic material and consumption of dissolved oxygen with depth. (Woodard-USGS)
W75-11497

HYDROLOGY FOR LAND-USE PLANNING: THE HILLSIDE AREA, ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W75-11504

NATURAL AND ACCELERATED PHOSPHATE MOBILITY, (IN DUTCH),
For primary bibliographic entry see Field 5C.
W75-11520

GEOCHEMISTRY OF SURFACE SEDIMENTS IN AN ACID STREAM ESTUARY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 2J.
W75-11531

KINETICS OF LEAD RETENTION AND DISTRIBUTION IN SUCKLING AND ADULT RATS,
Yugoslav Academy of Sciences and Arts, Zagreb. Inst. for Medical Research and Occupational Health.
B. Momcilovic, and K. Kostial.
Environmental Research, Vol 8, No 2, p 214-220, October 1974. 1 fig, 3 tab, 18 ref.

Descriptors: *Kinetics, *Lead, *Heavy metals, *Metabolism, Animal physiology, Gamma Ray, Radioactivity, Rodents, *Path of pollutants, *Absorption.
Identifiers: Suckling rats, Adult rats, Intraperitoneal injection, Scintillation counter, Brain, Blood, Kidneys, Liver, Teeth.

The kinetics of lead distribution was studied in suckling and adult rats eight days after a single intraperitoneal injection of 203 Pb. Marked differences were observed in the kinetics of lead retention and distribution in suckling as compared to adult rats. Most striking was the eightfold concentration of lead in the brain of sucklings as compared to adults. The rate of 203 Pb disappearance was lower in the whole body, blood and kidneys, but higher in the liver, while the deposition processes predominated in the brain, femur and teeth of sucklings as compared to adult animals. The activity of 203 Pb was determined in a scintillation counter. (Delfiner-Vanderbilt)
W75-11537

DETERMINATION OF THE APPARENT COMPLEXING CAPACITY OF LAKE WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
Y. K. Chau, R. Gachter, and K. Lum-Shue-Chan.
Journal of the Fisheries Research Board of Canada, Vol 31, No 9, p 1515-1519, September 1974. 3 fig, 1 tab, 18 ref.

Descriptors: *Heavy metals, *Trace elements, *Water chemistry, *Lakes, Pollutants, *Copper, Canada, Lake Erie, Lake Ontario.
Identifiers: *Stripping voltammetry(Anodic), *Lignands, Hamilton Harbor(Ont.).

A sensitive and accurate method is described for the measurement of the apparent complexing capacity of lake waters. It is based on the measurement of labile copper by differential pulse anodic stripping voltammetry after a number of ionic copper spikes have been allowed to equilibrate with the complexing materials in a water sample. Coefficients of variation for the determination of EDTA at a level of 0.50 micro mole per liter in Hamilton Harbor water were 6 and 8%. Analysis of 7 replicates of a Hamilton Harbor water sample gave an apparent complexing capacity of 0.52 micro mole per liter Cu equivalent with a relative standard deviation of 7.7%. Analyses of a number of samples from Lake Erie and from lakes near Sudbury, Ontario gave a range from nondectable to 0.70 micro mole per liter Cu equivalent of complexing capacity. (Delfiner-Vanderbilt)
W75-11538

LEAD AND ARSENIC LEVELS OF DAIRY CATTLE IN PROXIMITY TO A COPPER SMELTER,
Washington Univ., Seattle. Dept. of Environmental Health.
For primary bibliographic entry see Field 5A.
W75-11544

WATER QUALITY RELATIONSHIPS IN THE GREAT LAKES: ANALYSIS OF A SURVEY QUESTIONNAIRE,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
J. W. Bulkley, and A. P. Mathews.
Technical Report No 42, Septemb4r 1974. MICHU-SG-75-200. Grant No 04-4-158-23.

Descriptors: Water quality, *Water conservation, *Water quality control, *Water management(Applied), Water pollution, *Water utilization, Shores, *Shore protection, *Great Lakes, *Lakes, Governments, Water districts, Water resources development, Surveys, Sewage treatment, Land use, Industrial effluents, Population density.
Identifiers: Shore quality, Shoreline quality, Great Lakes shoreline, Shoreline maintenance, Shoreline management, Environmental surveys.

A questionnaire survey conducted among 650 govermental units in the Great Lakes area has identified the levels of water quality in the respective areas, the perceived factors contributing to the destruction of water resources and possible solutions to the problem of deteriorating water quality. One-way frequency distributions obtained, based on the 300 responses to the questionnaires, indicate that the water quality is medium or lower in 92% of the cases, while it is low or very low in 35% of the cases. Inadequate municipal sewage treatment and inadequate industrial effluent treatment were identified to be the most common factors causing the destruction of water resources. Analysis of two-variable relationships have been made with a view to link the chain of causal factors influencing water in the Great Lakes. Water quality is found to vary with the type of land use and population density, decreasing with increasing degree of industrialization and decreasing with increasing population density. (NOAA)
W75-11549

MERCURY CYCLING IN A SMALL HAWAIIAN ESTUARY,
Geological Survey, Honolulu, Hawaii. Water Resources Div.
For primary bibliographic entry see Field 5C.
W75-11563

THE SOLUBILITY BEHAVIOUR OF NO. 2 FUEL OIL IN SEA WATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
P. D. Boehm, and J. G. Quinn.
Reprint from Marine Pollution Bulletin, Volume 5, Number 7, p 101-105, July 1974. 2 fig, 1 tab, 18 ref. EPA Grant T-900140, Grant No. 04-3-158-3.

Descriptors: *Oil-water interfaces, *Fuels, *Oil, *Oil pollution, *Oil spills, *Gas chromatography, Oily water, Fossil fuel, Water pollution, Oil wastes, *Solubility, Organic compounds, Chromatography, Sea water, Petroleum, Pollutant identification.
Identifiers: Fuel oil solubility, Fuel oil, Oil solubility, Oil/water mixtures, No. 2 fuel oil, Crude oil, Hydrocarbon components, Marine pollution.

The solubility of No. 2 fuel oil in sea water is studied using gas chromatographic techniques. Evidence is presented for the existence of accommodated (particulate or droplet), solubilized (colloidal micelles) and soluble hydrocarbon components in fuel oil-sea water mixtures. (NOAA)
W75-11565

NITRIFICATION AND DENITRIFICATION DURING MISCIBLE DISPLACEMENT IN UNSATURATED SOIL,
California Univ., Davis.
For primary bibliographic entry see Field 3F.
W75-11596

KINETIC AND EQUILIBRIUM STUDIES OF BORON DESORPTION FROM SOIL,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W75-11600

COMPARATIVE EFFICIENCY OF SOLUBLE AND CONTROLLED-RELEASE SULFUR-COATED UREA NITROGEN FOR CORN IN TROPICS,
University of the West Indies, St. Augustine (Trinidad).
For primary bibliographic entry see Field 3F.
W75-11601

SULFUR AND MANGANESE RELEASE FROM SOILS TREATED WITH PRILLED SULFUR AND SULFUR-BENTONITE,
Missouri Univ., Clinton. Dept. of Agronomy.
D. L. Lindell, and R. C. Sonsen.
Soil Science Society of America Proceedings, Vol 38, No 2, p 368-372, March-April, 1974. 3 fig, 2 tab, 10 ref.

Descriptors: Fertilization, *Fertilizers, Sulfates, *Sulfur, Hydrogen, Soil properties, Soils, *Manganese, *Nebraska, *Soil treatment, Bentonite.
Identifiers: *Sulfur-bentonite.

Seven Nebraska soils were used to compare prilled sulfur and sulfur-bentonite formulation in regard to the amount of sulfate-sulfur, manganese and hydrogen released to a leaching solution after successive incubations. Also the effects of sulfur fertilizer granule concentrations in the soil were studied. Generally, the amount of sulfate-sulfur and manganese and the pH values in leachates from the columns containing sulfur-bentonite were not different from those from columns containing prilled sulfur. Differences among soils could not be explained on the basis of measured soil properties. The relationships between the amounts of sulfate-sulfur or manganese released and percentage sulfur or sulfur-bentonite in the soil were generally quadratic with the maximum release occurring in the range 30 to 60% sulfur. The greatest amount of sulfur released per gram sulfur added occurred at the lowest sulfur to soil ratio studied. (Skogerboe-Colorado State)
W75-11604

ORGANOCHLORINE COMPOUNDS IN SEVERAL MARINE ORGANISMS FROM THE NORTH SEA AND THE DUTCH WADDEN SEA,
Nederlands Instituut voor Onderzoek der Zee, Texel.
Ten, W. F. Berge, and M. Hillebrand.
Netherlands Journal of Sea Research, Vol 8, No 4, p 361-368, 1974. 1 fig, 4 tab, 5 ref.

Descriptors: Aquatic animals, *Organic compounds, *Halogenated pesticides, *Lipids, Pesticides, Herrings, Cod, Shrimp, Mussels, Phytoplankton, Zooplankton, DDD, DDE, DDT, Endrin, Dieldrin, Laboratory studies.
Identifiers: *Bioaccumulation, *Tissue analysis, Gadus morhua, Plaice, BHC, PCB, HCB, Clupea harengus, Pleuronectes platessa, Crangon crangon, Mytilus edulis, North Sea, Dutch Wadden Sea.

The content of organochlorine compounds (Dieldrin, Endrin, DDE, DDD, DDT, BHC, HCB) was determined in several marine organisms (herring, Clupea harengus; plaice, Pleuronectes platessa; cod, Gadus morhua; shrimp, Crangon crangon; mussels, Mytilus edulis, phytoplankton and zooplankton) from the North Sea and the Dutch Wadden Sea. The most striking result was the small difference, on lipid weight basis, in the content of organochlorine compounds between the different species. (Katz)
W75-11608

BARNACLES: POSSIBLE INDICATORS OF ZINC POLLUTION,
Natural Environmental Research Council, Anglesey (Wales). Unit of Marine Invertebrate Biology.
G. Walker, P. S. Rainbow, P. Foster, and D. J. Crisp.
Marine Biology, Vol 30, No 1, p 57-65, 1975. 2 fig, 3 tab, 26 ref.

Descriptors: *Bioindicators, *Heavy metals, *Zinc, Aquatic animals, *Animal physiology, Water pollution sources, Path of pollutants.
Identifiers: Balanus balanoides, Elminius modestus, Lepas anatifera, *Barnacles, Gut tissues, Tissue analysis, Bioaccumulation.

Barnacles (Balanus balanoides, Eliminius modestus, Lepas anatifera) from several different sites accumulate the heavy metal zinc. The majority of the zinc was deposited in the tissues associated with the gut, and the level of zinc in soft body tissue generally reflected well the level of zinc in the immediate sea-water environment. The zinc accumulated in the gut tissues was in the form of discrete granules, mainly within the parenchyma cells which surround the gut. These granules probably exist as an isoluble zinc salt. A comparison of the zinc level in barnacles with those recorded for some other marine organisms indicated the possible usefulness of barnacles as indicators of zinc pollution. (Katz)
W75-11611

HYDROCARBONS ASSOCIATED WITH SUSPENDED PARTICULATE MATTER IN SAN FRANCISCO BAY WATERS,
Naval Biomedical Research Lab., Oakland, Calif.
For primary bibliographic entry see Field 5A.
W75-11614

IMPROVEMENT OF COMBINED SEWER SYSTEM STORM WATER STORAGE POOL (GORYU-SHIKI GESUIDO NO KAIRYO, TAISUI IKE HOSHIKI),
For primary bibliographic entry see Field 5D.
W75-11621

SUBSURFACE WASTE INJECTION IN THE UNITED STATES: FIFTEEN CASE HISTORIES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 5D.
W75-11627

NUTRIENT TRANSPORT IN SURFACE RUNOFF AS INFLUENCED BY SOIL COVER AND SEASONAL PERIODS,
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
R. E. Burwell, D. R. Timmons, and R. F. Holt.
Soil Science Society of America Proceedings, Vol 39, No 3, p 523-528, May-June 1975. 5 tab, 14 ref.

Descriptors: *Nutrients, *Runoff, *Sediments, Nitrogen, Phosphorus, Potassium, Snowmelt, Precipitation(Atmospheric), Erosion, Agriculture, Chemistry of precipitation, Seasonal, Fertilizers, Surface runoff, Crops, On-site investigations, *Minnesota.
Identifiers: *Nutrient transport, Nutrient losses, Soil cover.

Nitrogen (N), phosphorus (P), and potassium (K) losses in surface runoff water and sediment were determined for five soil cover conditions on a Barnes loam soil in west-central Minnesota. The five soil cover conditions studied were: (1) continuous clean-cultivated fallow, (2) continuous corn, (3) corn in rotation, (4) oats in rotation, and (5) hay in rotation. Losses of water, sediment, and nutrients were determined for three seasonal periods: (1) critical runoff period caused by melting snow and ice, (2) critical erosion period from corn planting to 2 months later, and (3) noncritical runoff-erosion period exclusive of periods 1 and 2. Much of the annual sediment and nutrient losses occurred during the critical erosion period. Snowmelt runoff accounted for much of the annual water and soluble nutrient losses. Average annual quantities of NH4-N and NO3-N contributed by precipitation exceeded the annual losses in surface runoff, but ortho-P losses in surface runoff were greater than the amount contributed by precipitation. (Sims-ISWS)
W75-11641

FORMATION AND COLLAPSE OF SURFACE FILMS,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
For primary bibliographic entry see Field 2K.
W75-11642

A TOPOGRAPHIC-HYDROGEOLOGIC MODEL FOR SOLID WASTE LANDFILL SITING,
Iowa State Univ., Ames. Dept. of Earth Sciences.
L. V. A. Sendlein, and R. C. Palmquist.
Ground Water, Vol 13, No 3, p 260-268, May-June 1975. 10 fig, 18 ref.

Descriptors: *Landfills, *Water pollution, *Hydrogeology, *Solid wastes, *Waste disposal, Geomorphology, Topography, Land classification, Water quality, Groundwater, Surface waters, Permeability, Groundwater movement, Terraces(Geologic), Ravines, Valleys, Flood plains, Water table, *Model studies.
Identifiers: *Contamination enclaves, Upland flat, Crest.

Geomorphic and hydrogeologic studies have shown that the material, topographic, groundwater, and surface-water characteristics of a particular landscape position are all related. Because of this, an analysis of the topography should allow the prediction of the material, groundwater, and surface-water characteristics of a disposal site within the local area. Topographic consideration of potential solid waste disposal sites thus provides insight about the physical characteristics of the site and shape of the resulting contamination enclave. Possible topographic positions for disposal sites are floodplain, valley terrace, valley side, upland crest, upland ravine, upland valley and upland flat interfluve. Upland sites are characterized by the outward flow of both groundwater and surface water, whereas valley sites are characterized by the through flow of both ground and surface water. Upland sites are considered preferable over valley sites because of the greater

likelihood of the refuse remaining dry. An analysis of groundwater flow patterns indicates that the greatest potential for extensive groundwater contamination exists for upland sites, which are in groundwater recharge areas. The least potential for extensive contamination exists for properly placed valley sites, which are in groundwater discharge areas. (Visocky-ISWS)
W75-11644

SOLID PARTICLE SETTLEMENT IN OPEN-CHANNEL FLOW,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R-M. Li, and H. W. Shen.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11460, p 917-931, July 1975. 7 fig, 1 tab, 13 ref, 2 append. NSF ENG 74-03037.

Descriptors: *Computer models, *Sedimentation rates, *Settling velocity, *Stochastic processes, Turbulent flow, Hydraulics, Water pollution, Open channel flow.
Identifiers: *Random walk model, *Eulerian length scale.

A random walk was formulated to describe the settlement of solid particles in open-channel flows. Both uniform and mixed-size sediment particles were tested. Results from simulations indicated that the probability density function of the settling length can be a lognormal distribution. The mean settling length can be estimated by the ratio of the unit-width discharge to the fall velocity of particles. The coefficient of variation was determined to be a power function of the ratio between flow shear velocity and fall velocity of solid particles. The simulation results were generally in agreement with measured data. The procedure for the design of settling basins was presented. (Lardner-ISWS)
W75-11652

SANITARY-VIROLOGICAL STUDY OF THE EFFECTIVENESS OF DECONTAMINATION OF WASTE WATERS ON IRRIGATED FARM YIELDS, (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
M. S. Artykov.
Gig Sanit, Vol 38, No 4, p 110-111, 1973.

Descriptors: Irrigation, *Irrigation water, Crop production, Vegetables, Soils, Water reuse, Path of pollutants, Soil treatment, Viruses, Waste water(Pollution), *Waste water treatment.
Identifiers: Coxsackievirus, *Enteroviruses, Picornaviruses, *USSR(Uzbekistan).

The degree of enterovirus contamination of soil and vegetables grown under the hot climatic conditions of Uzbekistan (USSR) on fields irrigated with a mixture of household and industrial waste waters that underwent biological treatment was investigated. The irrigation waste water, soil and wash water from vegetables grown on the fields were studied. Virological investigations showed contamination by enteroviruses of all objects studied. Titration of the isolated cytopathic agents showed that the objects were contaminated by Coxsackie B virus. Waste water should not be used for crop irrigation.--Copyright 1975, Biological Abstracts, Inc.
W75-11674

DISTRIBUTION OF LIGNIN IN THE WATERS OF LOURIZAN INLET, AS A MEASUREMENT OF CONTAMINATION DUE TO DUMPING OF LIGNINSULFONIC LYES, RESULTING FROM PRODUCTION OF CELLULOSE PULP, (IN SPANISH),
Instituto Espanol de Oceanografia, Madrid (Spain).
Antonio Fernandez Del Riego.
Bol Inst Esp Oceanogr, 172 p 1-38, 1973. Illus.

Descriptors: Pulp and paper industry, *Water pollution sources, *Pulp wastes, Europe, Effluents, Industrial wastes, Waste water disposal, *Water purification, Treatment, *Water pollution treatment, Waste treatment, Flocculation, Filteration, Separation techniques, Carbonation, Sea water, Lignins, Mullets.
Identifiers: Cardium-edule, Ligninsulfonic, Lyes, Mytilus-edulis, Platichthys-flesus, *Spain, Lourizan inlet.

Pollution caused by the dumping of Kraft pulp lyes near the Playa de Placeres (Spain) make bathing impossible, produce a strong pungent odor and cause fish to avoid the large abiotic zone in this area. Conditions could be improved by recovering cellulose fibers in suspension and implementing improved biochemical purification in reservoirs. Lime treatment would change the color of effluents from their present dark brown to a clear yellow. Large scale dilution of these treated effluents in sea water and consequent flocculation of organic material would greatly decrease the biological oxygen demand of the water. Alkalinity caused by the lime would be eliminated through carbonation by a previous aeration and by the enormous diluting capacity of the sea water. Marine organisms observed in the polluted areas included eels, oysters, Cardium (=Cerastoderma) edulis, Mytilus edulis, Platichthys flesus and mullet.--Copyright 1975, Biological Abstracts, Inc.
W75-11678

URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-11710

CONTINUOUS MONITORING, AUTOMATED ANALYSIS AND SAMPLING PROCEDURES, (LITERATURE REVIEW),
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5A.
W75-11711

AGRICULTURAL USE OF SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5C.
W75-11720

COPPER UPTAKE AND EXCRETION BY BUSYCON CANALICULATUM L.,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W75-11755

A STEADY-STATE MODEL OF ISOTOPIC FRACTIONATION ACCOMPANYING NITROGEN TRANSFORMATIONS IN SOIL,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
G. Shearer, J. Duffy, D. H. Kohl, and B. Commoner.
Soil Science Society of America Proceedings, Vol 38, No 2, p 315-322, March-April, 1974. 3 fig, 17 ref.

Descriptors: *Mathematical studies, Nitrification, Ammonification, *Nitrogen, *Model studies, Soils, *Isotope fractionation, *Path of pollutants.

A steady-state mathematical model of isotopic fractionation accompanying certain nitrogen transformations in soil is developed. The model takes into account ammonification, nitrification, and immobilization; and predicts that the 15N/14N ratios of nitrate and ammonium ion depend in part upon the ratio of the rates of immobilization to nitrification under field conditions is unlikely to be the same as under the conditions of laboratory incubation experiments. Therefore, this prediction provides a possible explanation for differences observed between the 15N/14N ratio of nitrate extracted from soil cores and that of nitrate released during laboratory incubation of the same soils. The model described is ammenable to experimental test. If verified, an expanded version of the model may be a useful aid in the study of nitrogen transformations in the field. (Skogerboe-Colorado State)
W75-11831

5C. Effects Of Pollution

FISH TOXICANTS IN KRAFT EFFLUENTS,
British Columbia Univ., Vancourver. Dept. of Zoology.
I. H. Rogers, J. C. Davis, G. M. Kruzynski, H. W. Manhood, and J. A. Servizi.
Tappi, Vol 58, No 7, p 136-140, July, 1975. 6 fig, 18 ref, 1 tab.

Descriptors: *Pulp wastes, *Toxins, *Fish, Biological treatment, *Toxicity, Biochemical oxygen demand, Lethal limit, Freshwater, Saline water, Salmon, Bioassay, Aeration, Water pollution sources, Industrial wastes, Wastes, Waste water treatment, Effluents, Water pollution treatment, Water pollution control, Sockeye salmon, Chum salmon, Water quality standards, Water pollution effects, Pine trees, Softwood.
Identifiers: Resin acids, Lodgepole pine, Wood extractives, Dehydroabietic acid, Abietic acid, Kraft mills.

Biologically treated effluent from a bleached kraft mill was studied in a bench-model aeration system to determine whether additional biological treatment would consistently detoxify combined effluents. Comparison of 29, 58, and 99-hour treatment periods indicated that toxicity, BOD, and resin acids were most consistently reduced during the lengest treatment time and met current Canadian guidelines for kraft mill effluent. The neutral components of the effluent, derived mainly from the unsaponifiable fraction of lodgepole pine wood extractives, frequently caused fish mortalities, and were shown to be related to wood furnish. L.D.(50) values of 0.67 mg/liter (o.554-0.670, 95% confidence limits) in freshwater and 0.19 mg/liter (o.156-0.234, 95% confidence limits) in saltwater were determined in tests with the pinewood extract against chum salmon fry. Flowthrough freshwater bioassays with dehydroabietic acid against yearling sockeye salmon yielded an estimated 96-hour L.D.(50) of 0.5 mg/liter. In another test, yearling sockeye salmon exposed to a 1.5 mg/liter dehydroabietic acid concentration suffered 50% mortality in 94.5 hours in saltwater. The same fish stock, exposed to an equal resin acid concentration in freshwater, experienced 50% mortality in 14.7 hours. Thus, toxicity of the resin acid was greater in freshwater than in saltwater, which is the reverse of results obtained with the neutral fractions. (Sykes-IPC)
W75-11358

SANITARY AND BACTERIOLOGICAL EVALUATION OF THE RAW MATERIAL, AIR AND WASTEWATERS OF SOME BAST FIBER PLANTS IN THE UZBEK SSR, (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
For primary bibliographic entry see Field 5B.
W75-11406

SOME PROBLEMS OF THE CIRCULATION OF ENTEROVIRUSES IN ENVIRONMENTAL OBJECTS, (IN RUSSIAN),
Kuybyshevskii Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny (USSR).
For primary bibliographic entry see Field 5B.

W75-11438

RESPONSE OF COMPLETELY MIXED ACTIVATED SLUDGE SYSTEMS TO CHANGES IN THE ENVIRONMENT,
Oklahoma State Univ., Stillwater. Center for Water Research in Engineering.
For primary bibliographic entry see Field 5D.
W75-11478

EVALUATION OF THE QUALITY OF SURFACE WATER FOR DEVELOPING RECOMMENDATIONS OF NONSPECIFIC PROPHYLAXIS OF INTESTINAL INFECTIONS, (IN RUSSIAN),
Kuybyshevskii Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny (USSR).
S. N. Bukovskaya.
Gig Sanit, 2 p 103-104, 1974.

Descriptors: Water sampling, Water quality, Water supply, Domestic water, Industrial water, Public health, Water quality standards, Bacteria, Bioindicatior, Microorganisms, Surface water.
Identifiers: *Human infections(Intestinal), Pathogens, Prophylaxis.

Water samples (266) obtained in a study of microbial contamination of a body of water used as a domestic and industrial water supply source and as an effluent receiving body were analyzed. Pathogenic bacteria of the intestinal group were found in 16.7% of the samples. No correlation was found between indirect sanitary-bacteriological indices of water quality and direct isolation of pathogens. Consequently, both determination of the indirect indices and direct methods of isolating pathogens should be used when evaluating the epidemiological role of water in the occurrence of intestinal infections.--Copyright 1975, Biological Abstracts, Inc.
W75-11512

NATURAL AND ACCELERATED PHOSPHATE MOBILITY, (IN DUTCH),
H. L. Golterman.
Geol Mijnbouw, Vol 53, No 4, p 205-206, 1974.

Descriptors: Lakes, *Phosphates, *Water pollution sources, Sewage, Detergents, Chemical wastes, *Domestic wastes, *Cyanophyta, Europe, Water pollution effects, *Eutrophication.
Identifiers: *Netherlands.

High phosphate levels in Dutch lakes resulted from the incursion of phosphates into sewage at a faster rate than it could be removed by natural processes. Excessive phosphate in the lakes caused the outgrowth of toxic blue-green algae which may eventually make the drinking water unsafe. The replacement of phosphate detergents by NTA (nitrilotriacetic acid) and the artifical removal of phosphates from sewerage are advocated.--Copyright 1975, Biological Abstracts, Inc.
W75-11520

INFLUENCE OF LEAD ON CALCIUM AND STRONTIUM TRANSFER THROUGH THE DUODENAL WALL IN RATS,
Yugoslav Academy of Sciences and Arts, Zagreb. Inst. for Medical Research and Occupational Health.
N. Gruden, M. Stantic, and M. Buben.
Environmental Research, Vol 8, No 2, p 203-206, October, 1974, 2 tab, 7 ref.

Descriptors: *Lead, *Heavy metals, *Animal physiology, *Calcium, Diets, Mammals, Rodents, *Strontium.
Identifiers: Rats, Duodenal wall, Everted gut sac method, Lead acetate, Oral doses, Gastric intubation.

Five-week-old female albino rats were given daily doses for 1 or 2 weeks of lead as acetate ranging from 2 micrograms to 40 milligrams by gastric intubation and sacrificed on the 8th or 15th day of the experiment. Calcium-45 and 85Sr were used as markers to assess the calcium and strontium transfer through the duodenal wall by the everted gut sac method of Wilson and Wiseman (1954). Doses of lead acetate greater than 20 micrograms per day decreased the transfer of both calcium and strontium across the duodenal wall and these transfers decreased further with increased doses of lead, an effect which was independent of whether the rats were killed on the 8th or 15th day of the experiment. Doses of lead acetate greater than 200 micrograms per day, however, did not produce a further decrease in these transfers. The retention of both calcium and strontium in the intestinal wall was unaffected by the lead treatment. (Delfiner-Vanderbilt)
W75-11523

EMBRYOPATHIC EFFECTS OF DIFFERENT ROUTES OF ADMINISTRATION OF MERCURIC ACETATE IN THE HAMSTER,
Darmouth Medical School, Hanover, N.H. Dept. of Anatomy.
T. F. Gale.
Environmental Research, Vol 8, No 2, p 207-213, October, 1974, 1 tab, 29 ref.

Descriptors: *Mercury, Animal physiology, *Environmental effects, *Heavy metals, Transfer, Biological membranes, Mammals, Rodents.
Identifiers: *Mercury acetate, Hamster, *Embryopathic effects, Embrotoxicity, Intraperitoneal, Intravenous, Oral, Subcutaneous.

A comparison was made between 4 modes of administration of mercuric acetate into the pregnant golden hamster on Day 8 of gestation, i.e., intrapertoneal (ip), intravenous (iv), oral (0) and subcutaneous (sc) in respect to induced embryonic damage. The embryos were recovered either 4 or 6 days later and the number of resorption sites and abnormal embryos were recorded. The major manifestations of embryoic damage included an increased resorption rate, and small retarded edematous embryos. Several miscellaneous congenital malformations were also detected. In general, these embryopathic effects as well as indicators of maternal toxidity were dose dependent for each mode of administration. Primarily on the basis of equivalent resorption rates the following sequence of decreasing efficacy in producing harmful effects was demonstrated; ip greater than iv greater than sc greater than 0. The results are discussed within the general context of the known deleterious effects of mercury on biological systems and the controversy regarding the transmission in inorganic mercury from the pregnant animal to the developing embryo. (Delfiner-Vanderbilt)
W75-11524

BILIARY EXCRETION OF PHENYL AND METHYL MERCURY CHLORIDES AND THEIR ENTEROHEPATIC CIRCULATION IN RATS,
Institut Hygieny a Epidemiologie, Prague (Czechoslovakia).
M. Cikrt, and M. Tichy.
Environmental Research, Vol 8, No 1, p 71-81, August, 1974, 2 fig, 4 tab, 20 ref.

Descriptors: *Mercury, Animal physiology, *Kinetics, *Toxocity, Radioactivity techniques, Fungicides, *Pollutant identification, Rodents.
Identifiers: *Biliary excretion, *Phenyl mercury chloride, *Methyl mercury chloride, *Enterohepatic circulation in rats, Inorganic mercury scintillation counter.

The kinetics of biliary excretion of mercury applied as phenyl mercury (203) chloride (PMC) or methylmercury (203) chloride (MMC) were studied in rats during the first 24 hours after intravenous administration. The content of total mercury in the bile, plasma, liver, kidneys, gastrointestinal tract, urine, and feces was determined. The enterohepatic circulation of mercury after administration of PMC in rats was compared with that after administration of MMC or inorganic mercury. The differences found in both the kinetics and the distribution of PMC, MMC, and inorganic mercury in rats were discussed. (Delfiner-Vanderbilt)
W75-11525

EFFECTS OF METHYLMERCURY CHLORIDE ON RANA PIPIENS TADPOLES,
Wisconsin Univ., Madison. Dept. of Pathology.
L. W. Chang, K. R. Reuhl, and A. W. Dudley, Jr.
Environmental Research, Vol 8, No 1, p 82-91, August, 1974, 4 fig, 1 tab, 53 ref.

Descriptors: *Mercury, *Aquatic environment, *Frogs, *Immature growth stage, *Water pollution effects, Animal physiology, Pathology.
Identifiers: *Methylmercuric chloride, *Tadpoles, Histochemical techniques, Light microscopic examination.

Rana pipiens tadpoles were allowed to be raised in water containing various concentrations of methylmercuric chloride or were injected with 0.025 ml of 0.1% aqueous solutions of methylmercuric chloride (0.025 mg Hg), every other day for ten days. All the tadpoles which were raised in water containing more than 0.05 ppm mercury died within 48 hours. The distention of body cavities and eventual death of these tadpoles was believed to be the result of a disturbance of the osmotic regulatory system by the mercury. Total arrest of further development and differentiation was observed in tadpoles which were raised in water containing 0.001-0.01 ppm mercury. Extensive deposition of blood pigment (hemosiderosis) was observed in the livers of the mercury-injected tadpoles, which was though to be predisposed by the hemolysis of the red blood cells by mercury followed by severe peripheral edema and hemopoietic reactions in the kidneys of these tadpoles. (Delfiner-Vanderbilt)
W75-11527

UPTAKE, DISTRIBUTION AND FATE OF 203 HG-ETHYLMERCURIC CHLORIDE IN THE GUPPY AND THE COONTAIL,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
S. C. Fang.
Environmental Research, Vol 8, No 1, p 112-118, August, 1974. 3 fig, 3 tab, 6 ref.

Descriptors: *Heavy metals, *Mercury, *Fish, Environmental effects, *Water pollution effects, *Radioactivity, Physiology, Spectrophotometry, Gas chromatography, Pollutant identification, Path of pollutants, Absorption.
Identifiers: *Mercury-ethylmercuric chloride, *Guppy, *Coontail, Gammascintillation, Inorganic mercury, Organic mercury, Electron capture detector.

The guppy (Lebistes resticulatus) and coontail (Ceratophyllum demersum) were exposed to water containing 203 Hg-labeled ethylmercuric chloride (EMC). The EMC uptake was related to the time of exposure and the concentration of EMC. Highest concentration of 203 Hg was found in the internal organs of the guppy and the body has the least concentration. The biological half-life of 203 Hg from EMC was approximately between 20 and 23 days. Both organisms are capable of converting the absorbed EMC to inorganic mercury with the coontail having a slightly higher rate (34%) of conversion as compared to the average of 29% for the guppy during a seven-day period. Both organisms accumulated slightly more methylmercuric chloride (MMC) than EMC from a solution containing the same concentration of EMC or MMC. There was little conversion of MMC to inorganic

mercury by the guppy, indicating the stability of MMC in this organism. The absorbed MMC molecule was also more stable than the EMC in the coontail. (Delfiner-Vanderbilt)
W75-11529

ULTRASTRUCTURAL EFFECTS OF ACUTE TETRAETHYLLEAD POISONING ON NERVE CELLS OF THE RABBIT BRAIN,
Cincinnati Univ., Ohio. Dept. of Environmental Health.
W. J. Niklowitz.
Environmental Research, Vol 8, No 1, p 17-36, Aug, 1974, 8 fig, 65 ref.

Descriptors: *Poisons, *Heavy metals, *Lead, *Cytological studies, Laboratory animal, Small animals(Mammals), Animal physiology.
Identifiers: *Tetraethyllead poisoning, Rabbit brain, *Nerve cells, Cytopathogenesis.

The ultrastructural effects on nerve cell components of selected brain areas (frontal cortex, cerebellum, hippocampus) were studied after exposure of rabbits to tetraethyllead (TEL). A single dose of 100 mg/kg of TEL leads, after a latency period of 12 to 18 hours, to neurological disorders such as convulsions, and produces significant lesions of components of pyramidal cells and astroglial cells. These develop before the onset of major neurological signs of toxic manifestation. In general two types of degenerative cell changes were identified: cellular pyknosis and cellular hydrops, each specific to certain cell layers of selected brain areas. The subcellular manifestation of nerve cells undergoing hydropic degeneration exhibit a distinct pattern. The following sequence of appearance of structural alterations was determined: (1) folding of the nuclear membrane, (2) swelling and severe lesions of mitochondria, (3) hypertrophy of Golgi complexes and (4) patchy chromatolysis of the ergastoplasm. Progressive hypertrophy of Golgi saccules and vacuolization of the ergastoplasm areas lead to a vaculor hydropic degeneration of affected nerve cells. The cytopathogenesis is discussed in regard to recent findings concerning the subcellular mechanism of tetraethyllead intoxication. (Delfiner-Vanderbilt)
W75-11530

PHYTOPLANKTON IN LAKE MASCARDI (RIO NEGRO, ARGENTINA), (IN SPANISH),
Institute National de Limnologie, Santo Tome (Argentina).
Maria O. Garcia De Emiliani, and Marta Schiaffino.
Bol Sci Argent Bot, Vol 15, No 4, p 411-426, 1974, Illus.

Descriptors: *Chlorophyll, Lakes, *Phytoplankton, Sampling, Stratification, Temperature, Seasonal, Thermal stratification, Water pollution effects.
Identifiers: Ankistrodesmus-gracilis, *Argentina(Lake Mascardi), Melosira-pseudogranulata, Rhizosolenia-eriensis, Rhodomonas-minuta, Rio-negro, Transparency, Manso River, *Algal growth.

A study of the phytoplankton in Mascardi Lake, carried out from March 1970-April 1971, was done on the basis of periodical samplings in 3 stations at various depths. Qualitative and quantitative changes in the composition of the phytoplankton population and some considerations to the chlorophyll a content and relations to different physical and chemical parameters were studied. Mascardi is a monomictic lake with temperature always above 4C during the circulation period (July-Sept.) and thermal stratification with a thermocline of variable depth localization (between 30-35 m deep). The thermal behavior of the lake and the water transparency reveal the influence of Manso River (the main tributary) exert especially on the west branch of the lake. The vernal circulation provides favorable conditions for algal growth due to the increase of nutrient concentration together with relatively benign temperatures. Cell number begins to increase at that period, reaching maximum concentrations in Sept. and diminishing progressively during summer and autumn. The most frequent species found were: Ankistrodesmus gracilis, Rhodomonas minuta, Rhizosolenia eriensis and Melosira pseudogranulata.--Copyright 1975, Biological Abstracts, Inc.
W75-11532

THE OCCURRENCE OF MERCURY IN AMPHIBIA,
Ljubljana Univ. (Yugoslavia). J. Steffan Inst.
For primary bibliographic entry see Field 5A.
W75-11534

EFFECTS OF FISH-PONDS NEAR JAKUBOVO ON THE ORNITHOCENOSE THERE, (IN CZECH),
Komenskeho Universita, Bratislava (Czechoslovakia). Katedra Syst. Ekol. Zool.
L. Kocian.
Biologia (Bratisl), Vol 28, No 8, p 671-678, 1973.

Descriptors: *Fish ponds, *Vegetation, Water pollution effects.
Identifiers: *Czechoslovakia(Jakubovo), *Ornithocenosis.

In 1968-1969 an ornithocenological study was carried out on some fish-ponds in Zahorie (Czechoslovakia). The building of new fish-ponds has had an effect on the ornithocenose, and it is compared with the ornithocenose of an earlier stage--wet meadows. In the 1st stage the dominant birds live among the water plants; in the 2nd stage, birds living on the water surface predominate. The number of birds living among water plants remains the same in the 2nd stage; birds living on the water surface showed some changes. In the 2nd stage there was an increase in the number of species living on the edges and banks of ponds. Birds belonging to the steppe group make use of the ponds and their vegetation as trophic or hiding areas. Comparing fish-ponds with large water expanses, the elements are relatively similar. In both cases the ecological group of birds living on the water surface predominates.--Copyright 1975, Biological Abstracts, Inc.
W75-11535

KINETICS OF LEAD RETENTION AND DISTRIBUTION IN SUCKLING AND ADULT RATS,
Yugoslav Academy of Sciences and Arts, Zagreb. Inst. for Medical Research and Occupational Health.
For primary bibliographic entry see Field 5B.
W75-11537

A FOOD WEB MODEL FOR LAKE MICHIGAN PART 2-MODEL FORMULATION AND PRELIMINARY VERIFICATION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
R. P. Canale, L. M. DePalma, and A. H. Vogel.
Technical Report No 43. March 1975 150 p, 78 fig, 8 tab, 79 ref. MICHU-SG-75-201. Grant No 04-5-158-16.

Descriptors: *Food chains, *Food webs, *Ecosystems, *Limnology, *Lake Michigan, Nutrients, Balance of nature, Fish food organisms, Biology, Eutrophication, Life cycles, Zooplankton, Plankton, Phytoplankton, Fish, Ecological distribution.
Identifiers: Food models, Food web model, Alewife concentrations.

Previous plankton models for the Great Lakes have considered the interactions among dissolved nutrients, chlorophyll a, and total zooplankton. These models have been developed primarily for the purpose of predicting the gross effects of nutrient input control and urban growth on the phytoplankton standing crop. However, more complex ecological problems, such as the effect of eutrophication on the forage fish and the effect of foreign marine fish species on the plankton composition, require complex food web models. The purpose of this report is to justify, develop, and verify a preliminary lower food web model for Lake Michigan. The report details the underlying hypothesis, mathematical formulation, and preliminary verification of a lower trophic-level model. It is expected that the model will provide guidance on the requirements of additional scientific research on food web transfer mechanisms and on the requirements of a comprehensive field monitoring program. (NOAA)
W75-11547

WATER QUALITY RELATIONSHIPS IN THE GREAT LAKES: ANALYSIS OF A SURVEY QUESTIONNAIRE,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-11549

MERCURY CYCLING IN A SMALL HAWAIIAN ESTUARY,
Geological Survey, Honolulu, Hawaii. Water Resources Div.
S. N. Luoma.
Tech. Memo. Report No. 42, Sea Grant College Working Paper No. 5, December 1974. 42 p. (NSG) 14-31-0001-3811 and 4011; 04-3-158-29 (NOAA).

Descriptors: *Mercury, Biochemistry, *Heavy metals, Metals, Water pollution, Public health, Toxicity, Model studies, Mathematical studies, Estuaries, *Estuarine environment, Oceanography, Ecosystems, *Hawaii.
Identifiers: *Inorganic mercury cycling, Heavy metal contamination, Mercury analyses, Mercury poisoning, Nereis succinea, Palaemon debilis, Mercury content, Ala Wai Canal(HI).

Uptake from food and water and loss of 203 $HgCl_2$ were studied in two detritus feeders the polychaete Nereis succinea and the shrimp Palaemon debilis. During 1973 to 1974, total mercury analyses were also conducted on sediment and biota samples collected. Detritus feeders concentrated dissolved 203 Hg from 160 to 310 times over the concentration is sea water. Little 203 Hg was accumulated from labelled estuarine sediment; the steady state concentration of 203 Hg in the animals was 0.0025 to 0.015 times the concentration in the sediment the animals ingested. Net excretion of 203 Hg was slow relative to accumulation in both species. The total mercury content of shrimp and worms collected from the estuary showed a temporal pattern of variation. Samples of shrimp collected at five day intervals were used, with a mathematical description of the accumulation and loss of metal by the shrimp to simulate biotic mercury dynamics in the estuary. The simulation showed that mercury levels in shrimp in the Ala Wai Canal were never at steady state over the 1973-74 sampling period, and indicated the most important source of biologically available mercury in the estuary was some inorganic, solute form of the metal. (NOAA)
W75-11563

INFLUENCE OF SOME BIOCIDES EMPLOYED IN THE WOOD-PROCESSING INDUSTRY ON GROWTH OF GREEN ALGAE,
Jyvaskyla Univ. (Finland). Dept. of Biology.
V. Eloranta.
Aqua Fennica, p 21-32, 1974. 6 fig, 2 tab, 24 ref.

Descriptors: *Chlorophyta, *Pesticides, *Organic pesticides, *Chlorophyll, *Toxicity, Lethal limits, Primary productivity, Water pollution sources, Pulp and paper industry.

Identifiers: *Ankistrodesmus falcatus, Chlorophyll-a, *Biocides, *Slimicides, Bioaccumulation, NasPCP, Panacide, Fennosan, F-50, S-45, Grace 849, Fennosan B-100.

The effects of six organic biocides on green algae, Ankistrodesmus falcatus were studied. Chlorophyll-a content was used as a measure of growth. Na-PCP, commonly used in pulp and paper industries, was the most toxic of the slimicides. The LC-50 was 1.0 mg/l Na-PCP for green algae. Panacide, also a cyclic hydrocarbon and containing chlorine, was next toxic. Fennosan F-50, S-45, and Grace 849 were less toxic. Fennosan B-100 was least toxic. (Katz)
W75-11605

SHELL DISEASE IN CRABS AND LOBSTERS FROM NEW YORK BIGHT,
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Lab.
J. S. Young, and J. B. Pearce.
Marine Pollution Bulletin, Vol 6, No 7, p 101-105, July 1975. 4 fig, 22 ref.

Descriptors: *Crabs, *Lobsters, *Benthic fauna, *Crustaceans, *Sewage, *Sludge, *Wastes, Animal physiology, Water pollution sources, Environmental effects, Laboratory tests, Toxicity, New York.
Identifiers: Cancer irroratus, *Rock crabs, Shells, Gills, Pathology, New York Bight.

Lobsters, Homarus americanus, and rock crabs, Cancer irroratus, were collected in or near the sewage sludge and spoil disposal grounds from the New York Bight. Various pathological conditions were found in the shells and gills. The histopathology of 'shell disease', the causative agents and its effects on respiration were discussed in light of the disposal of solid wastes into the ocean. (Katz)
W75-11606

PHYTOPLANKTON DIVERSITY AND CHLOROPHYLL-A IN A POLLUTED ESTUARY,
Montclair State Coll., Upper Montclair, N.J. Dept. of Biology.
J. M. McCormick, and P. T. Quinn.
Marine Pollution Bulletin, Vol 6, No 7, p 105-106, July 1975. 2 fig, 1 tab, 6 ref.

Descriptors: *Phytoplankton, *Chlorophyll, *Estuaries, *Nannoplankton, *Seasons, Photosynthesis, Water pollution sources, Speciation, Biomass, Temperature, Salinity, Dissolved oxygen, Laboratory studies, Bioindicators, *New Jersey.
Identifiers: *Chlorophyll-a, Newark Bay(NJ).

The quantity of phytoplankton in Newark Bay, New Jersey as indicated by chlorophyll-a content of the water, was low in winter and early spring, and fluctuated greatly during spring and summer. Chlorophyll-a concentrations were less than 20 micro g/l until April. Between April and August, three phytoplankton blooms were indicated by concentrations up to 81.4 micro g/l. Net phytoplankton diversity values indicated generally eutrophic conditions; however, there was no significant correlation between diversity and chlorophyll-a concentrations. A role of nannoplankton in blooms was indicated. Temperature, salinity and dissolved oxygen variations were also measured. (Katz)
W75-11607

ORGANOCHLORINE COMPOUNDS IN SEVERAL MARINE ORGANISMS FROM THE NORTH SEA AND THE DUTCH WADDEN SEA,
Nederlands Instituut voor Onderzoek der Zee, Texel.
For primary bibliographic entry see Field 5B.
W75-11608

HIGH COPPER CONCENTRATIONS IN SQUID LIVERS IN ASSOCIATION WITH ELEVATED LEVELS OF SILVER, CADMIUM AND ZINC,
Moss Landing Marine Labs., Calif.
J. H. Martin, and A. R. Flegal.
Marine Biology, Vol 30, No 1, p 51-55, 1975. 1 fig, 4 tab, 17 ref.

Descriptors: *Aquatic animals, *Animal physiology, *Metals, *Molluscs, Silver, Cadmium, Zinc, Copper, Iron, Path of pollutants, Bioassay, Laboratory tests, Metabolism, Pollutant identification.
Identifiers: *Squids, Loligo opalescens, Ommastrephes bartrami, Symplectoteuthis oualaniensis, Livers, Tissue analysis, Bioaccumulation, Sublethal concentrations.

Livers from 43 Loligo opalescens, 14 Ommastrephes bartrami, and 7 Symplectoteuthis oualaniensis were analyzed for their silver, cadmium, copper, zinc and iron contents. Copper concentrations of up to 15,000 micro g/g dry weight were found in L. opalescens in conjunction with significant correlations between this element and Ag, Cd, and Zn. The latter elements are known to affect Cu metabolism in terrestrial organisms; however, whether the correlations occurring in marine organisms represent casual, or cause and effect, relationships is as yet unknown. (Katz)
W75-11609

SYNERGISTIC EFFECTS OF SALINITY, TEMPERATURE AND HEAVY METALS ON MORTALITY AND OSMOREGULATION IN MARINE AND ESTUARINE ISOPODS (CRUSTACEA),
Liverpool Univ., Port Erin (England). Dept. of Marine Biology.
M. B. Jones.
Marine Biology, Vol 30, No 1, p 13-20, 1975. 5 fig, 6 tab, 28 ref.

Descriptors: *Heavy metals, *Isopods, *Crustaceans, *Temperature, *Salinity, Mortality, Toxicity, Bioassay, Laboratory tests, Cadmium, Zinc, Lead, Mercury, Water pollution effects.
Identifiers: *Osmoregulation, *Synergistic effects, *LT-50, Idotea baltica, Idotea neglecta, Idotea emarginata, Eurydice pulchra, Jaera albifrons, Jaera nordmanni, Bioaccumulation.

Marine species (Idotea baltica, I. neglecta, I. emarginata, and Eurydice pulchra) and estuarine species (Jaera albifrons and J. nordmanni) of isopods demonstrated low mortalities in 100% SW with 10 and 20 ppm of Cd, Zn, and Pb, but a decrease in salinity caused an increase in the toxicities of these metals and reduced the LT-50 values. Mortalities at 10 degrees C were generally higher than those recorded at 5 degrees C. Effects of heavy metals upon the osmoregulatory ability of the isopods were indicated. (Katz)
W75-11610

DECOMPOSITION OF UREA ASSOCIATED WITH PHOTOSYNTHESIS OF PHYTOPLANKTON IN COASTAL WATERS,
Nagoya Univ. (Japan). Water Research Lab.
O. Mitamura, and Y. Saijo.
Marine Biology, Vol 30, No 1, p 67-72, 1975. 3 fig, 2 tab, 22 ref.

Descriptors: *Ureas, *Nitrogen compounds, *Photosynthesis, Light, *Phytoplankton, Aquatic life, Nitrites, Ammonia, Nitrates, Nitrogen cycle, Tracers, Decomposing, Organic matter, Coasts, Carbon dioxide.
Identifiers: *Light intensities, Decomposition, C-14, Bioaccumulation.

The urea concentation in seawater in Mikawa Bay, Japan ranged from 1.3 to 5.9 microgram-at.N/l and comprised 12-40% of the dissolved organic nitrogen. Using 14C labelled urea, the rate of CO2 liberation from urea and the incorporation rate of urea carbon into the particulate organic matter were determined. Incubation experiments with exposure to different light intensities revealed that the rate of CO2 liberation from urea and the incorporation of urea carbon into particulate organic matter change with light intensity, showing a pattern similar to that of photosynthesis. (Katz)
W75-11612

THE ESTIMATION OF THE AMOUNT OF EMPIRE MIX CRUDE OIL IN MULLET, SHRIMP, AND OYSTERS BY LIQUID CHROMATOGRAPHY,
Mississippi State Univ., Mississippi State. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-11613

AGRICULTURAL USE OF SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
L. R. Webber, and B. C. Hilliard.
In: Sludge Handling and Disposal Seminar Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 120-142, (1974). 6 fig, 5 tab, 12 ref.

Descriptors: *Sludge, *Land use, *Environmental effects, *Soil properties, Phosphorus, Nitrogen, Cadmium, Crops, Fertilizers, Algae, Lakes, Eutrophication, Water quality, Water table, Toxicity, Water pollution effects, Path of pollutants.
Identifiers: Zinc-cadmium ratio.

The environmental impact of land disposal of wastes is discussed. For sludge disposal to agricultural lands, soil properties should be evaluated. Soils with a high water table are not suitable for waste disposal. Studies are being done on concentrations and movement of nitrogenous compounds in the soil, the distribution of phosphorus, and the assessment of cadmium in crops and soil. Nitrogen in sludge applied to agricultural land is useful as fertilizer and can increase crop yield. Phosphorus can also be useful for agriculture. Both of these elements are suspect in lake eutrophication, growth of algae, and poor water quality. Cadmium in certain quantities is toxic to man and animals; the absorption of cadmium by plants may relate to the zinc-cadmium ratio of the soil. (See also W75-11715) (Dean-FIRL)
W75-11720

DISPOSAL OF CHEMICAL SEWAGE SLUDGES ON LAND AND THEIR EFFECTS ON PLANTS, LEACHATE AND SOIL SYSTEMS,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
For primary bibliographic entry see Field 5E.
W75-11721

COPPER AND ZINC IN CANCER IRRORATUS: COMPARATIVE METABOLISM OF THE MOLT CYCLE, LE CUIVRE ET LE ZINC CHEZ CANCER IRRORATUS (CRUSTACE:DECAPODE): METABOLISME COMPARE AU COURS DU CYCLE D'INTERMUE,
CEA Centre de la Hague, Cherbourg (France). Laboratoire de Radioecologie Marine.
J-L. M. Martin.
Comparative Biochemistry and Physiology, Vol 51, No 4A, p 777-784, August 1975. 3 fig, 1 tab, 40 ref.

Descriptors: *Heavy metals, *Copper, *Zinc, *Crab, *Crustaceans, Animal physiology, Life cycles.
Identifiers: *Cancer irroratus, *Tissue analysis, *Bioaccumulation, Intermoult cycle, Muscles, Hemolymph, Sublethal concentrations.

Variations of copper and zinc content were analyzed during the intermoult cycle for Cancer irroratus in the following organs and tissues: ex-

oskeleton, hepatopancreas, hypoderm, gills, hemolymph and muscles. The hemolymph showed the largest copper concentration while the muscles presented the largest zinc content. Except for the muscles, all organs and tissues showed significant ($P < 0.01$) variations of zinc during the intermoult cycle. Variations of copper content were statistically different ($P < 0.01$) in any tissue. A significant increase ($P < 0.01$) of the copper and zinc content took place in the hemolymph during the C4 stage. A correlation-regression analysis between copper, zinc and water content was carried out for each tissue and organ. A positive correlation ($P < 0.01$) between both metals occurred for the hemolymph, the gills and the hepatopancreas. Hypotheses were proposed to explain such correlations. (Katz)
W75-11752

A METHOD FOR INTERMITTENT CHLORINE DOSING IN CONTINUOUS-FLOW TOXICITY TESTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5A.
W75-11754

COPPER UPTAKE AND EXCRETION BY BUSYCON CANALICULATUM L.,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
S. B. Betzer, and M. E. Q. Pilson.
The Biological Bulletin, Vol 148, No 1, p 1-15, February 1975. 4 fig, 1 tab, 16 ref.

Descriptors: *Copper, *Snails, Invertebrates, Animal physiology, *Metals, *Path of pollutants, *Tracers, *Gastropods, Spawning, Life cycles, Bioassay, Laboratory tests, Absorption.
Identifiers: *Excretion, *Busycon canaliculatum, 64Cu, Tissue analysis, Bioaccumulation.

Pathways of copper into channeled whelk, Busycon canaliculatum, and sites of accumulation were investigated in uptake experiments using 64Cu. Routes of possible copper loss were investigated in excretion experiments (rate: 7 micro g/24 hr per 100 g fresh tissue weight and by determination of copper content of egg capsules (23 micro g/capsule). 64 Cu appeared in the gills, blood, kidney, gut and digestive gland. Spawning was suggested as a significant route for copper loss. (Katz)
W75-11755

MERCURY LEVELS IN FISH IN THE LA GRANDE RIVER AREA, NORTHERN QUEBEC,
McGill Univ., Montreal (Quebec).
For primary bibliographic entry see Field 5A.
W75-11756

THE BROWN PELICAN AND CERTAIN ENVIRONMENTAL POLLUTANTS IN LOUISIANA,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
For primary bibliographic entry see Field 5A.
W75-11757

AN ECOLOGICAL SURVEY OF THE ROCKY COAST ADJACENT TO A BROMINE EXTRACTION WORKS,
Natural Environment Research Council, Anglesey (Wales). Unit of Marine Invertebrate Biology; and University Coll. of North Wales, Menai Bridge. Marine Science Labs.
R. Hoare, and K. Hiscock.
Estuarine and Coastal Marine Science, Vol 2, No 4, p 329-348, October 1974. 3 fig, 2 plate, 4 tab, 43 ref.

Descriptors: Effluents, *Halogens, *Bromine, Water quality, *Chlorine, *Chemical wastes, Surveys, *Rhodophyta, *Crustaceans, *Algae, *Amphipoda, Saline water, *Hydrogen ion concentration, Growth rates, Water pollution sources, Environmental effects, Silts, Toxicity, Plant physiology, Animal physiology.
Identifiers: Echinoderms, Polyzoa, Laminaria hyperborea.

Investigations of the fauna and flora of a rocky coast were carried out in the vicinity of an acidified, halogenated effluent discharge. Many species, both littoral and sublittoral, were excluded from the area of the outfall while a few were present in increased numbers. Echinoderms, Polyzoa and Amphipod Crustacea together with the red algae appear to be particularly sensitive to the reduction in water quality. An analysis of the fauna associated with Laminaria hyperborea suggested the presence of a pollution gradient with numbers of species increasing with distance from the outfall. Several algal species showed retarded or abnormal growth especially in the littoral region. Data are presented for the pH and free chlorine content of the sea water and possible reasons for the distribution of prominent species are discussed. (Katz)
W75-11758

BIOLOGICAL CONSIDERATIONS ON THE USE OF THERMAL EFFLUENTS FOR FINFISH AQUACULTURE,
Oceanic Inst., Waimanalo, Hawaii.
J. R. Sylvester.
Aquaculture, Vol 6, No 1, p 1-10, July 1975. 1 tab, 50 ref.

Descriptors: *Effluents, *Fish, *Aquaculture, *Fish farming, *Thermal pollution, *Temperature, *Warm-water fish, Water quality, Metabolism, On-site laboratories, Sampling.

The use of thermal effluents was suggested as a source of warm water to control and maintain a fish farm system within optimum thermal limits. High temperatures of thermal effluents would exert their primary effect on cultured organisms through increased activity and metabolism. Site studies in thermal effluents indicated that the principal fishes attracted to thermal effluent areas were warmwater species and that these fish could provide suitable culture animals. (Katz)
W75-11759

ELIMINATION OF HYDROCARBONS BY MUSSELS,
Instituto di Biologia del Mare, Venice (Italy).
V. U. Fossato.
Marine Pollution Bulletin, Vol 6, No 1, p 7-11, January 1975. 2 fig, 1 tab, 17 ref.

Descriptors: *Organic compounds, *Mussels, *Water pollution sources, *Water temperature, *Animal physiology, Laboratory tests, *Oil.
Identifiers: *Mytilus galloprovincialis, Elimination, *Tissue analysis, Bivalves, Bioaccumulation.

Mussels, Mytilus galloprovincialis, collected from hydrocarbon polluted areas of the Lagoon of Venice were transferred to the relatively unpolluted port entrance of Malamocco. Hydrocarbon elimination was rapid in the first 10-15 days but later was slow and incomplete: 12% of the initial content persisted in the tissue for 8 weeks. Elimination of hydrocarbons was independent of water temperature between 7.5-26 degrees C. but virtually ceased in one lot when the temperature abruptly dropped from about 11 degrees C to 4.5-6.0 degrees C. The biological half-life of hydrocarbons in the mussels was calculated to be 3 1/2+ days, but this related only to the initial rapid phase of elimination. (Katz)
W75-11760

THE GROWTH OF POSIDONIA AND THE URBAN POLLUTION IN THE GULF OF GIENS, (IN FRENCH),
Institut Scientifique et Technique des Peches Maritimes, Nantes (France). Service de Pollution.
P. Maggi.
Ann Inst Michel Pacha, Vol 5, No 1, p 1-11, 1972, Illus.

Descriptors: Europe, *Urbanization, *Water pollution sources, Erosion, *Accelerated erosion, *Sediment control, Sands, Plant breeding, *Water pollution treatment.
Identifiers: *France(Giens Gulf), Posidonia-Oceanica, Pollution, *Posidonia, Light sediment, *Urban pollution.

Studies were carried out in the Gulf of Giens (France), which receives a large amount of urban pollution. This pollution may be the reason for the disappearance over a large area of Posidonia oceanica, which played a large part in fixing the light sediments. This resulted in hollowing of the sea floor and severe erosion of the sand beaches. A solution aimed at stopping the sources of pollution is considered. The problem of reconquest of the light sediments is approached by an original method of P. oceanica reimplantation. An 18 mo. trial showed that slips of the plants take root firmly in a sand bottom.--Copyright 1975, Biological Abstracts, Inc.
W75-11761

FURTHER OBSERVATIONS ON THE EFFECT OF SODIUM SALT OF 2,4-D ON EARLY DEVELOPMENTAL STAGES OF CARP (CYPRINUS CARPIO L.),
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
E. Kamler, O. Matlak, and K. Srokosz.
Polskii Archiwum Hydrobiologii, Vol 21, No 3-4, p 481-502, 1974. 10 fig, 7 tab, 51 ref.

Descriptors: *Sodium compounds, *Salts, *Carp, *Herbicides, *2-4-D, *Fish physiology, *Growth stages, Larvae, Toxicity, Mortality, Growth rates, Feeding rates, Environmental effects, Behavior, Metabolism, Water pollution effects.
Identifiers: Pielik, Sublethal concentrations.

Acute tests (48 hrs) demonstrated that the herbicidal formulated product 'Pielik' is about twice more toxic than the pure sodium salt of 2,4-5. The mortality test was the least sensitive of all acute tests applied for Cyprinus carpio. Long-term tests were much more sensitive than the acute ones. 'Pielik' continuously applied in a concentration of 50 mg active ingredient/l caused delayed hatching, behavioral changes, feeding impairment, severe morphological disturbances, slower growth rate and finally mass mortality of larvae. The observed drop in oxygen consumption, with a simultaneous increase in respiratory quotient and lactic acid content, indicated that 'Pielik' impairs the metabolic aerobic processes in favor of the anaerobic ones. (Katz)
W75-11762

5D. Waste Treatment Processes

REMOVAL OF SOLUBLE MERCURY FROM WASTE WATER BY COMPLEXING TECHNIQUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
D. L. Michelsen, J. A. Gideon, G. P. Griffith, J. E. Pace, and H. L. Kutat.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 890, $6.25 in paper copy, $2.25 in microfiche. Bulletin 74, Virginia Water Resources Research Center, Blacksburg, May 1975. 161 p, 37 fig, 29 tab, 111 ref. OWRT A-044-VA(3).

Descriptors: Mercury, *Waste water treatment, Milk, Rubber, *Ion exchange, Economics, Heavy metals, Anion exchange, Cation exchange, Absorption, Ions.
Identifiers: *Mercury removal, Complexing techniques, Xanthates, Keratin, *Tannery hair.

Milk proteins, xanthates, modified rubber products, and keratin in various forms can be used for the removal of ionic mercury from water systems. In particular, anionic and cationic ion-exchange products made from ground tire cord rubber compete very favorably with classical ion-exchange resins with regard to capacity and rate of pickup. Cow and pig hair selectively remove ionic mercury, and the performance with tannery hair based on equilibrium capacity, rate of removal, and pressure drop was as good as classical ion-exchange resins. Regenerative studies of ionic mercury from tannery hair with HCl and NaCl were successful, and a number of scale-up studies including economics were completed to illustrate how tannery hair might be used for the treatment of waste streams containing ionic mercury. Compared to the existing state of the art, the results were very encouraging.
W75-11357

FISH TOXICANTS IN KRAFT EFFLUENTS,
British Columbia Univ., Vancouver. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-11358

METHODS AND EQUIPMENT FOR THE TREATMENT OF SPENT OIL EMULSIONS (VERFAHREN UND ANLAGEN ZUR BEHANDLUNG VERBRAUCHTER OEL-EMULSIONEN),
F. Rueb.
Wasser, Luft und Betrieb, Vol 19, No 7, p 415-419, 1975. 8 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Oil wastes, Oily water, Separation techniques, Filters, Centrifugation, Electrolytes, Emulsions, Flocculation, Membrane processes.
Identifiers: Ultrafiltration.

Methods and equipment for the treatment of used oil emulsions are described. Emulsion breakage is accomplished by using separating agents and temperatures up to 80C; the resulting oil and water phases are separated by centrifugation. Water containing traces of oil is passed through a filter system containing wood chips and a separating agent to obtain water with a residual oil content of 20-25 mg/liter. The separating agent expenditure can be reduced by preliminary emulsion breakage by means of less expensive electrolytes or salts. A residual oil content of 20 mg/liter can be achieved by chemical separation, using salts, acids, or flocculants for emulsion breakage. A fully automatic and continuous process uses sulfuric acid for the hot emulsion, and neutralizes the separated water. Aluminum and iron sulfates, iron chloride, sodium hydroxide, and flocculation aids are used in a batch type flocculation process. Thermal processes, yielding water vapor and used oil, are usually combined with catalytic afterburners to reduce air pollution. Ultrafiltration through cellulose acetate or polyamide membranes, combined with preliminary filtration, is suitable for continuous or batch operation at low energy expenditure. (Takacs-FIRL)
W75-11359

SEPARATION OF EMULSIFIED OIL FROM WATER,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
L. K. Wang, J. Y. Yang, and D. B. Dahm.
Chemistry and Industry, No 13, p 562-564, July 5, 1975. 40 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Emulsions, *Reviews, Oil wastes, Oily water, *Separation techniques, Equipment, Flotation, Adsorption, Chromatography, Filtration, Membrane processes, Absorption, Centrifugation, Evaporation, Freezing, Oxidation.
Identifiers: Bilge water, Refinery wastes, Steel manufacturing wastes.

Oil-water emulsions are found in waste effluent streams from many sources, including the discharge of bilge and balast water from ships, washrack and hanger waste water, petroleum refineries, rolling mills, and chemical processing and manufacturing plants. A review of the state-of-the-art development of alternative commercial techniques for separating emulsified oil is presented. Techniques include conventional flotation, precipitate flotation, adsorption flotation, magnetization, coalescence, chromatography, layer filtration, membrane filtration, absorption and adsorption, centrifuge and hydrocyclone treatment, sedimentation, chemical coagulation, heating, evaporation and distillation, crystallization or freezing, biological oxidation, clarification-flotation, and filtration-extraction-filtration. A brief description of each of these processes is given. Although there are many commercial devices available for the removal of emulsified oil from water, there is no one economical and efficient method. (Orr-FIRL)
W75-11360

OPTIMUM DESIGN OF SOUR WATER STRIPPERS,
Exxon Research and Engineering Co., Florham Park, N.J. Fractionation/Thermodynamics Section.
G. A. Melin, J. L. Niedzwiecki, and A. M. Goldstein.
Chemical Engineering Progress, Vol 71, No 5, p 78-82, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Computer models, Economics, Capital costs, Operating costs, Ammonia, Hydrogen sulfide.
Identifiers: *Refinery wastes, *Sour water strippers.

Sour water stripping is an important process in the pollution abatement practices of petroleum refineries. Although the optimum design of sour water strippers had been of little concern until recently due to the relative ease of removing H2S, the more strict requirements for the removal of NH3 have necessitated research into optimizing the design. Computer simulations were used to examine the effect of various operating parameters on sour water stripper performance. The parameters included: steam-to-feed ratio; number of theoretical trays; feed tray location; feed temperature; distillate drum temperature and pressure; feed H2S and NH3 concentration levels. The steam-to-feed ratio and the number of theoretical trays are the two most important design parameters. The economic optimization of sour water strippers required information on the efficiency of tower internals (trays or packing), the operating costs (primarily the cost of steam), the effect of operating conditions on steam consumption, the operating limitation set by other process equipment, and materials selection. The most important factor in the optimum economic design of a stripper is to balance investment costs with operating costs. Because other contaminants present in waste water change the pH of the water and thus affect the stripping of H2S and NH3, it is necessary to determine what particular species are present and at what concentration levels. The optimum design for a sour water stripper will include more trays than are currently used a rectifying section, and the addition of a strong base near the bottom of a single stripper to aid in the removal of tied up NH3. (Orr-FIRL)
W75-11361

SEQUENTIAL TREATMENT OF KRAFT PULP WASHING WASTEWATER BY PILOT PLANT-ACTIVATED SLUDGE TREATMENT, LIME TREATMENT AND ACTIVATED CARBON TREATMENT, (IN JAPANESE),
T. Fujii, H. Kabeya, H. Kamishima, T. Kubo, and J. Hosokawa.
Shikoku Kogyo Gijutsu Snikenjo Hokoku, (Rep of the Gov Ind Res Inst, Skikoku), Vol 7, No 1, p 1-13, March, 1975. 10 fig, 8 tab, 15 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Activated sludge, Lime, Activated carbon, Pulp wastes, Pilot plants, Color, Water reuse, Chemical oxygen demand, Lignins.

A sequential treatment consisting of activated sludge treatment, lime treatment, and activated carbon adsorption treatment was tested on unbleached kraft pulp mill washing waste water in a pilot plant system. Activated carbon adsorption was performed on water pretreated by activated sludge and lime. The fixed-bed activated carbon adsorption column system consisted of six columns filled with graular activated carbon of 8-30 mesh. Each column was 2 m long with a diameter of 15 cm. The flow rate was 60 liters/hour. The quality of the raw waste water was about 400 ppm COD, about 280 ppm lignin, and about 2400 platinum units of color. Treatment by a combination of activated sludge and lime resulted in about 90 percent removal of the COD, about 85 percent removal of lignin, and about 90 percent removal of color. The activated carbon treatment of this pretreated effluent produced a colorless, extremely low COD water suitable for reuse. The adosprtion efficiency of each activated carbon adsorption column was also estimated. (Orr-FIRL)
W75-11362

FLOAT-WASH FRACTIONATOR SAVES FIBRE AND WATER AT GRAND'MERE,
Consolidated-Bathurst Ltd., Grand'Mere (Quebec).
K. Godin.
Pulp and Paper Canada, Vol 76, No 6, p 81-83, June, 1975. 5 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Water reuse, Suspended solids, Separation techniques, Equipment, Water consumption, Water conservation.
Identifiers: White water, Float-Wash Fractionator.

A pollution abatement program was initiated in 1973 at Consolidated-Bathurst's paper mill at Grand-Mere, Quebec. The Boxboard Department was found to be contributing more than its share to mill solids losses. Although the largest amount of solids losses within the Boxboard Department could be blamed on accidental spills, caused by equipment carelessness, and frequent grade changes, an appreciable amount of the ss losses was due to the white water overflows from the Board Machine itself. It was felt that the surplus white water could be used to replace the cold fresh water used on the flood showers, oxcillating high pressure showers, and trim squirts of the Board Machine. A Type A06 Float-Wash Fractionator was tested for its treatment of the white water. The fractionator consists of two steel vessels stacked one above the other and separated by six spray nozzles, six fractionating devices and an overflow pipe, an inlet header, an outlet for the coarse fraction, an outlet for the fine fraction, an automatic bleeding valve with associated vacuum control equipment, and a vacuum pump. Problems during the trial included: loss of vacuum control when replacing screens; water flowing into the vacuum signal line; erratic control of vacuum level; and splitting of screens. Almost all of the problems were solved by installing new screens of a polyamine material, instead of polyester screens like the old screens. The recycling of white water on the Board Machine has not created any major

operating problems. Suspended solids losses, as a percentage of production, have decreased dramatically. Fresh water consumption has been reduced by about 300 gal within the Board Department. (Orr-FIRL)
W75-11363

NEW EFFLUENT TREATMENT PLANT OPENED AT BRISTOL FOR BOARD MILLS.
Water Services, Vol 79, No 952, p 232-234, June, 1975. 4 fig.

Descriptors: *Industrial wastes, *Waste water treatment, *Pulp and paper industry, Mixing, Flocculation, Sludge treatment, Filtration, Aeration, Water reuse.
Identifiers: Clariflocculators, Rotary vacuum filters, Screw presses.

A comprehensive effluent treatment plant has been built to treat the waste from St. Anne's Board Mill Company, Bristol, G.B. The Board Mill produces about 140,000 tons annually of board which is used in the manufacture of cigarette cartons, detergent cartons, rocord sleeves, and as packing for pharmaceuticals, toiletries, toys, games, and electrical items. Equipment at the facility consists of a flash mixer, two clariflocculators, a storage thickner, four filters, two screw presses, and two floating surface aerators. All effluent streams are combined and pass through a rotating cup screen, where coarse tramp material is removed. Raw effluent is dosed with alum and lime before entering the flash mixer. Polyelectrolyte is added immediately after the mixer to induce flocculation of suspended particles in the effluent stream. The dosed effluent then enters two identical Dorr Clariflocculators arranged in parallel. Clarified effluent overflows the peripheral weirs of the clariflocculators and flows to a lagoon where the dissolved oxygen level in the effluent is increased by the use of two floating aerators. Up to 200,000 gph of the clarified effluent can be returned to the water treatment plant to be chlorinated and then returned to the mill water system. Suspended solids are removed from the effluent stream after chemical and mechanical flocculation and passed into the sludge thickener where consolidation to about 5 percent solids occurs. Further dewatering of the sludge to 20-25 percent solids is performed by four Oliver rotary vacuum filters. Final dewatering to 45 percent solids is carried out by two Krima screw presses. Filtrate water is returned to the flash mixers for additional treatment because the ss level is too high to permit direct discharge. (Orr-FIRL)
W75-11364

LAND SPREADING EFFLUENT FROM A SECONDARY FACILITY,
General Electric Co., St. Petersburg, Fla. Environmental Health Div.
C. H. Applegate, and D. Y. Gray.
Water and Sewage Works, Vol 122, No 7, p 85-87, July, 1975. 4 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, *Waste water disposal, Activated sludge, Irrigation, Water reuse, Neutralization.
Identifiers: Land application, Spray irrigation, Combined municipal and industrial wastes.

The Pinellas Plant in west central Florida employs about 1150 people for the design, development and manufacture of specialty electronic and mechanical nuclear weapons components. Industrial and municipal wastes from the plant are being treated by a system which utilizes two retention lakes coupled through a spray irrigation field with subsurface drainage. The system, implemented in 1973, is capable of treating a maximum projected volume of 205,000 gpd. The effluent meets the criteria of the State of Florida Waste Treatment Standards and produces water of sufficient quality for reuse within the treatment plant for the cooling towers and deionized water facility. Sanitary wastes are treated in an extended aeration activated sludge plant. After chlorination, the sanitary effluent is passed through underground piping where it joins the plant's industrial wastes which have been treated in a neutralization facility where the normally acidic pH is automatically adjusted by the addition of sodium hydroxide. The combined wastes enter the lake for an average retention time of 52 days. The first lake also contains floating aerators. Water from the first lake is withdrawn through a strainer sump by one of two alternately operating pumps. A timed programmer directs the water flow to any single row of sprinklers or to any combination of six rows, each containing eight sprinkler heads. Polyethylene pipes are installed between each row of sprinklers and are connected to another polyethylene pipe which discharges the field drainage into a sump. Water from the field sump is pumped into the second lake and retained an average of 65 days. The effluent released from this lake is controlled by a dam with a valved outlet and eventually enters a salt water bayou after flowing through a series of county drainage ditches. (Orr-FIRL)
W75-11365

CITY, INDUSTRY FACE POLLUTION ABATEMENT TOGETHER,
Camp, Dresser and McKee, Inc., Boston, Mass.
W. H. Ringer, and W. C. Freeman.
The American City, Vol 90, No 6, p 101-103, June, 1975. 4 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, Activated sludge, Interceptor sewers, Screens, Landfills, Settling basins, Centrifugation, Sludge treatment, Filtration, Plastics, Pulp and paper industry, Cities.
Identifiers: Pressurized heat treatment, Vacuum filtration, Combined municipal and industrial wastes.

The new municipal treatment facility at Haverhill, Mass. will also treat wastes from plastics and paper board production. The sewage and industrial wastes will be collected by interceptor sewers and pumped to the treatment plant via a force main. Raw sewage will be passed through catenary-type mechanically cleaned bar screens. Grit and primary solids will be separated in primary sedimentation basins, concentrated by travelling bridge scrapers in the primary basins, and pumped to vortex-type separators and classifiers. Centrifugal separators will be used to separate grit from sludge. The primary sludge will be discharged to gravity thickeners. Secondary treatment will be an activated sludge system. Three aeration tanks will be built that can be used for conventional, completely mixed, or step activated sludbe treatment. Tank aeration and mixing will be effected by mechanical aerators; foaming will be controlled by an antifoam spray. The activated sludge will be passed to three clarifiers for separation of sludge from plant effluent. The effluent will be chlorinated prior to discharge into the river. The waste activated sludge will be thickened by flotation. Both the thickened primary sludge and waste activated sludge will be subjected to pressurized heat treatment in a low pressure, wet air system. The processes sludge will be dewatered on vacuum filters. Screening, grit, and processed sludge will be disposed of at the city landfill. Projected completion date of the plant is mid-1976; total project cost will be $30.5 million. (Orr-FIRL)
W75-11366

METHOD FOR RECLAIMING INDUSTRIAL WASTES AND ELIMINATING POLLUTION,
J. M. Haviland.
Canadian Patent 968,891. Issued June 3, 1975. The Patent Office Record, Vol 103, No 22, p 85, June 3, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Metals, Recycling, Chemical precipitation, Sludge treatment, Centrifugation.
Identifiers: Metal recycling.

A process for removing one or more metal compound contaminants from contaminated industrial waste water is described. The metal compound contaminants are precipitated from the waste water to form aqueous metal compound sludge. The sludge is allowed to settle, and is concentrated by centrifugation. The metal compound contaminants are reclaimed from the sludge for reuse as either the metal compounds or the free metals. (Orr-FIRL)
W75-11367

WATCH THAT WATER,
G. Cook.
British Steel, No 28, p 23-26, June, 1975. 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Water reuse, Steel, Cooling water, Biological treatment, Activated sludge, Recirculated water, Water consumption, Water conservation, *Recycling.
Identifiers: *Steel manufacturing industry, Air/water heat exchangers, Open evaporative cooling towers.

The Appleby-Frodingham Works of the British Steel Corporation uses recycling systems for all major water demands. Although by 1976 the output of steel from the plant will have increased by about 220 percent from 1972, the intake of freshwater will have increased by only 100 percent. Changes in the steelmaking process and careful consideration of all aspects of water conservation and pollution prevention account for the savings in water usage. A total cooling water flow of 900 cu m/min is handled by 41 separate systems which may be divided into two groups: systems in which the water is used only to remove heat, indirect cooling systems; and, combined cooling and cleaning systems, direct cooling systems. Air/water heat exchangers are being used in addition to open evaporative cooling towers. Treatment of the direct cooling waters which have absorbed solids from the processes as well as heat is performed in a biological treatment plant commissioned in June 1974. The effluents are collected in a large holding reservoir used to equalize fluctuations in effluent flow and quality in addition to providing storage for the temporary failure of collecting pipes or the treatment plant. The mixed liquor is treated by activated sludge and then clarified. The effluent from the clarifier is stored in a 'tidal storage' reservoir and discharged into the River Trent during a 4 hr period around each high tide. Sludge is thickened to about 3 percent w/w and then lagooned. The plant has made good progress toward achieving the required degree of treatment. (Orr-FIRL)
W75-11368

DEHYDRATING INDUSTRIAL SLUDGES BY FILTRATION.
Belgian Patent BE 821-579. Issued April 29, 1975. Derwent Belgian Patents Report, Vol W, No 20, p 2, June 24, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Sludge treatment, *Filtration, *Patents, Flocculation, *Dehydration, Filters.

A method for dehydration of flocculated industrial sludges by filtration is described. The filter device consists of a supporting filter-bag structure of polyester or polyamide filaments lined with a nonwoven textile, preferably a needled felt or random web, made of synthetic fibers. The filters have a high efficiency and effectiveness for retaining small particles. They can be used for sludges from the ceramic, metallurgical, paper, and sugar industries, chipboard and vegetable preserve manufacturing, wire presses, slaughterhouses, latex waste waters, mirror polishing, stainless steel etching neutralization, electroplating, and dissociated emulsions. (Orr-FIRL)

W75-11369

PLATING AND CYANIDE WASTES, (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
J. E. Germain, and S. R. Kellogg.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1479-1483, June, 1975. 113 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, *Reviews, Water reuse, Recirculated water, Membrane processes, Ion exchange, Neutralization, Chemical precipitation, Adsorption, Analytical techniques, Sampling, Patents, Standards, Evaporation, Reverse osmosis, Activated carbon, Electrolysis, Ozone, Polymers, *Bibliographies.
Identifiers: *Metal plating wastes, *Cyanide wastes, Closed-loop plating, Freeze-crystallization, Effluent guidelines.

The 1973-74 literature concerned with the treatment of plating and cyanide wastes was reviewed. Topics covered include recycling and recovery, membrane processes and ion exchange, neutralization and precipitation, adsorption, cyanides, sampling and analytical methods, patents, and effluent guidelines. Countercurrent rinsing was used to effect water use reductions. Atmospheric evaporative towers, freeze-crystallization, mixing of alkaline and acid wastes, and neutralization/ precipitation/ion exchange are some of the methods used to form closed-loop plating processes. Plating wastes may also be treated by reverse osmosis, ion exchange, activated carbon adsorption, or FeS sludge adsorption. Cyanide wastes may be treated with H2O2., a cobalt-based catalyst and chloride-producting electrolytic cells, various electrolysis methods, electrodialysis, oxonation and ion exchange. Methods for the removal of heavy metals from waste water include a wool or silk filter treated with dilute alkali or dilute acid, treatment with a sulfur containing agent and diffusion through peat, or polymer addition. (Orr-FIRL)
W75-11370

ACCELERATION OF BIOCHEMICAL TREATMENT OF WASTEWATER IN PETROLEUM REFINERIES,
Ya. A. Karelin, D. D. Zhukov, I. A. Saidaminov, O. N. Klochkov, and M. A. Denisov.
International Chemical Engineering, Vol 15, No 3, p 560-562, July, 1975. 2 fig, 2 tab. Trans from Nefte Pererabotka i Neftekhimiya, No 9, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Oil wastes, Municipal wastes, Sludge, Activated sludge, Aeration, Flotation.
Identifiers: Refinery wastes, Biochemical treatment, Pressurized flotation, Sludge thickening, Combined municipal and industrial wastes.

Pressurized flotation has been widely used in the treatment of petroleum products containing water, and for concentrating sediment and excess sludge. A two-stage biochemical treatment unit has been developed in which the first-stage sludge separator is a pressurized flotation unit. The unit consists of a Stage I aerotank-mixer, a flotation sludge separator, a Stage II aerotank-mixer, and a vertical settler. It treats refinery wastes and municipal sanitary sewage. A sludge dose of 15-16 g/liter is maintained in the Stage I aerotank-mixer. The sludge mixture is pumped from the aerotank to a pressure tank, saturated with air at a pressure of 3.0-3.4 kgf/sq cm, and passed through a reducing valve into the flotation chamber. The concentration of sludge in the surface water in the flotation tank is 30-33 g/liter; this is passed to the Stage II aerotank. Sludge is precipitated in the Stage II separator and transferred to a distributor tank. Part of the sludge from the distributor tank is combined with the sludge-air mixture from the pressure tank and then subjected to flotation and consolidation. The other part of the sludge is returned to the State II aerotank. Pressurized flotation produces a rapid separation of high-concentration sludge mixtures and return of a highly concentrated activated sludge to the aeration zone, thereby maintaining large doses of sludge in the aerotank. The oxidation capacity is increased, the time for sludge deparation is reduced, and the degree of sludge thickening is increased over conventional values by using this process. (Orr-FIRL)
W75-11371

ADVANCED TREATMENT OF WASTE WATER FROM MACHINERY WORKS BY ACTIVATED CARBON (KASSEITAN NI YORU KIKAI KOJO HAISUI NO KODO SHORI),
M. Kishi.
Yosui to Haisui, (Jour. of Water and Waste), Vol 17, No 8, p 1011-1015, August, 1975. 4 fig, 7 tab, 5 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Activated carbon, *Tertiary treatment, Biochemical oxygen demand, Chemical oxygen demand, Surfactants, Oily water, Oil wastes, Water reuse.
Identifiers: *Machinery factories.

The use of activated carbon as the advanced treatment method for waste water discharged from machinery factories was discussed. Biological treatment of this waste water was difficult since the BOD varied greatly. Typical machinery factories discharged waste water containing low BOD and COD in the range from 30 to 50 ppm as well as suspended oil residues and surfactants. The efficiency of activated carbon for the removal of GOD and COD was high if the waste water contained low levels of BOD and COD; about 80 percent COD removal could be expected. The activated carbon treatment would be most effective as the advanced treatment for waste water from machinery factories; the treated water is suitable for reuse. When the activated carbon method was applied to effluent from a machinery factory which treated its effluent by flotation followed by sand filtration, the quality of the treated water obtained was COD, 3.1 ppm, BOD, 5 ppm, ss, 5.3 ppm, and n-hexane extractable components, 0.9 ppm. The concentrations in the original waste water were COD, 16.8 ppm, BOD, 27.6 ppm, ss, 36.1 ppm, and n-hexane extractable components, 3.4 ppm. (Katayama-FIRL)
W75-11372

STUDIES ON RECOVERY OF CHEMICALS AND MANUFACTURE OF ACTIVATED SUBSTANCES FROM PULPING WASTE LIQUOR, PART 2, USE OF SOFTWOOD KP-WASTE LIQUOR, (IN JAPANESE),
Hokkaido Univ., Sapporo (Japan). Dept. of Applied Chemistry.
K. Tosaka, and J. Hayaski.
21Japan Tappi, Vol 29, No 6, p 40-47, June, 1975. 6 tab, 2 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Pulp wastes, Activated carbon, Color.
Identifiers: *Activated adsorptive substances, Kraft pulping waste liquor, Decolorization.

Studies were performed on the manufacture of activated adsorptive substances from softwood kraft pulping waste liquor. NaOH contained in the liquor was carbonated with CO2 gas and the concentrated matter was directly activated with Na2SO4 under several sets of conditions without carbonization. The activated substances prepared with 10 perdent Na2SO4 at 750 or 800C for one or two hours had a decolorization effect on the kraft pulp washing liquor comparable with or superior to the commercially available activated carbon 'Shirasagi'. The activated substances prepared with Glauber's salt or solution showed excellent relative efficiency but lower yield than the anhydride and were therefore considered unsatisfactory. The activated substances prepared at 750 or 900C also showed methylene blue adsorption and specific surface area comparable to those of 'Shirasagi'. (Orr-FIRL)
W75-11373

TREATMENT OF WASTE WATER FROM TEXTILE DYEING PROCESS (SENSHOKU HAISUI SHORI),
K. Tsukabayashi.
Yuki Gosei Kagaku Kyokai-shi, (Jour. of Synthetic Organic Chemistry Japan), Vol 33, No 5, p 377-383, May, 1975. 5 fig, 8 tab, 12 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Dyes, Color, Chemical precipitation, Flotation, Filtration, Adsorption, Biological treatment, Biochemical oxygen demand, Ozone, Activated carbon.
Identifiers: Decolorization, Textile dyeing wastes, Zero discharge.

Treatment methods for waste water discharged from textile dyeing processes are reviewed. These are coagulation precipitation, flotation, filtration, adsorption, and biological methods. The coagulation precipitation method removes about 60 percent of the BOD and COD from the waste water, and 90 percent of the color. However, the large quantity of sludge generated is one of the problems with this method. The flotation method has a larger surface load capacity for waste water treatment than the coagulation precipitation method permitting the use of a smaller facility with the flotation method to achieve the same results as a larger coagulation precipitation facility. Both these methods are very effective in the decolorization of waste water. Selection of the appropriate coagulation agent will permit removal of most dyes. The adsorption method by activated carbon or bauxite is suitable as a secondary treatment method for waste water rather than as a primary method. The presence of chromium, copper, chloride, and aldehydes in waste water can be toxic to biological activity. Ozone treatment is excellent but very expensive; it can be used as a secondary treatment method. Any combination of these methods will produce water which will meet water quality standards. A completely-closed system of water/waste water is difficult to maintain in textile industries because of the high quality of water that is needed in some of the individual processes. (Katayama-FIRL)
W75-11374

REDUCED COST FLOCCULATION OF A TEXTILE DYEING WASTEWATER,
Saint Regis Paper Co., West Nyack, N.Y.
J. S. Kace, and H. B. Linford.
Journal Water Pollution Control Federation, Vol 47, No 7, p 1971-1976, July, 1975. 5 fig, 1 tab, 10 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Dyes, Costs, Flocculation, Coagulation, Polyelectrolytes, Color, Aluminum.
Identifiers: Disperse dyes, PEI 400.

The polyelectrolyte flocculation of a simulated textile waste water with and without the addition of coagulants was investigated. The two disperse dyes tested were Artisil Blue-Green and Artisil Red. Five polyelectrolytes were screened for their effectiveness in flocculating the dyes at a pH of 7.0. The three cationic polyelectolytes examined were capable of achieving better than 90 percent color removal. The two anionic polyacrylamides studied were not capable of achieving flocculation over a wide range of dosages. PEI 400, a polyethyleneimine polyelectrolyte, was found to require the lowest dosage to achieve effective flocculation. Studies of the flocculation of the dyes with PEI 400 at pH 5.0 and 4.5 in an attempt to reduce the polymer dosage required showed that the amount of polymer could be reduced but

that a sharp optimum occurs at the lower pH values indicating that control of this flocculation system would be critical. A relatively low aluminum ion dosage was capable of reducing the residual color by coagulation to an acceptable level. A combined polymer and aluminum system was capable of achieving a color removal better (95 percent) than either chemical used alone with a low level of redispersion. A plot of the optimum flocculation points as Al(+++) dosage required versus PEI dosage required shows nearly a hyperbolic relationship between these ordinates, indicating that they are interacting synergistically. Filtration studies were performed to provide a measure of the filterability of the generated sludges. The results of the two dyes studied were similar. The filtration rate decreased as the amount of the aluminum hydroxide floc present increased. High percentage polymer flocs showed a relatively fast filtration rate. Costs are discussed for the tested combinations of treatment. (Orr-FIRL)
W75-11375

STUDIES ON THE TREATMENT OF WASTEWATERS FROM THE TOWEL DYEING INDUSTRY,
H. Takechi, S. Kagawa, K. Senba, and S. Kurosaka.
Kogai, (Pollution Control), Vol 10, No 4, p 38-48, July, 1975. 14 fig, 9 tab, 13 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Dyes, Color, Aeration, Coagulation, Sedimentation, Chemical oxygen demand, Trickling filters, Activated sludge, Ozone, Activated carbon.
Identifiers: *Japan.

Studied were conducted on the treatment of waste water from the towel dyeing industry in Japan. In order to comply with the 1971 pollution regulations of Japan, it was necessary to install an overall storage tank for waste water from various sources. During a detention time of about one half day, the pH is maintained in the range from 6.5 to 8.0 by an automatic pH regulator. It was also necessary to install an aeration basin capable of aerating the waste water for about four hours in order to mix the waste water with air and increase the dissolved oxygen concentration. Coagulative sedimentation was investigated as a method for the reduction of chemical oxygen demand (COD). The addition of 100-600 ppm of aluminum sulfate, 3 ppm of a high polymer coagulant, and 2 ml/liter of an emulsion of calcium hydroxide achieved a COD removal of nearly 50 percent. However, the method is not recommended because of the large amount of sludge produced. Trickling filter processes and activated sludge were effective methods for COD reduction to below 100 ppm. Treatment with ozone to reduce the color content of waste water was tested. Ozonation was effective for waste water from factories using reactive dye, but was ineffective for those from factories using threne dye, naphthol dye, and/or sulfur dye. However, since about 90 percent of the dye used in the towel dyeing industry in the Ehime Prefecture is reactive dye, treatment with ozone is a viable method for this area. Treatment with activated carbon was also effective in the removal of color; the decoloration effect was greatly enhanced by the combined use of activated carbon with ozone. (Orr-FIRL)
W75-11376

TREATMENT AND DISPOSAL OF ANODIZING EFFLUENTS, PART I,
Grand Sheet Metal Products Co., Melrose Park, Ill. Croname Div.
R. Satee.
Products Finishing, Vol 39, No 10, p 75-79, July, 1975. 1 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Waste water disposal, Neutralization, Water reuse, Phosphates.
Identifiers: *Anodizing effluents.

Part one of an article dealing with the treatment and disposal of anodizing effluents discusses general treatment goals, processes found in such plants, consitituents of the waste water, and neutralization as an in-plant treatment operation. The type of equipment and testing facilities used are determined by the objective of the plant. Any modern anodizing plant will include the following baths: cleaners; bright dips; etchants; anoidizing; desmutting; sealing; and, conversion coating. The final waste water may contain phosphates, sulfates, chlorides, fluorides, chromium, nitrates, nickel, and aluminum. Design of an effective treatment system should begin with collection of waste water samples over a week of normal activity. Analysis of the samples will provide an average concentration range. The flow rate should also be determined. An estimate of the degree of pollution of the waste water can be obtained by comparison with raw water sources; notable increases are usually found in chloride, sulfate, phosphate, and nitrate along with substantial increases in chromium, nickel, and aluminum. After the metal hydroxides are precipitated and removed from the waste water, the main problem left is the removal of phosphates. Many anoidizing plants have a separate area or station where the additions for pollution control can be made continuously. Most anodizing plant waste after pH treatment will have an acceptable pH ranging from 7.0 to 7.5, due to the reaction of acidic constituents with alkaline solution from etching rinses. Since the rate of flow is known, the rate at which a solution of sodium hydroxide must be added to maintain a proper pH can be easily calculated. An example is given. (Orr-FIRL)
W75-11377

TREATMENT AND DISPOSAL OF ANODIZING EFFLUENTS, PART II,
Grand Sheet Metal Products Co., Melrose Park, Ill. Cronome Div.
R. Satee.
Products Finishing, Vol 39, No 11, p 68-73, August, 1975. 1 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Waste water disposal, Flocculation, Phosphates, Coagulation. Lime, Chromium, Settling basins, Surface waters, Discharge(Water), Water reuse.
Identifiers: *Anodizing effluents.

Part two of an article dealing with the treatment and disposal of anodizing effluents discusses the addition and effectiveness of flocculating agents, phosphate removal by coagulation followed by lime treatment or treatment with trivalent metal ions, removal of hexavalent chromium, extra-plant facilities such as settling tanks, ponds, or lagoons, and discharge into surface waters which must include sampling and testing. Removal of metal hydroxides and other suspended solids from the final effluent can be achieved effectively and rapidly by the addition of certain organic polymers. The only advantages of lime treatment for phosphorus removal is that it is relatively inexpensive, and effective when stringent standards are not enforced. Disadvantages of the process are that the precipitation of phosphorus by lime is very slow; particles of the precipitate may behave like colloids; and, certain polymeric phosphates form soluble phsophate complexes with calcium. A highly effective treatment for phosphates removal involves the use of metal salts such as ferric or aluminum chloride or aluminum sulfate. Waste pickling liquors can be used for phosphorus removal. Batch treatment of hexavalent chromium employs sulfur dioxide, in the form of sodium metabisulfite, for the reduction of the hexavalent chromium to trivalent. Sulfur dioxide gas may be used for the continuous reduction of chromium in conversion coating wastes. Ferrous sulfate can also effectively reduce chromium. A series of ponds or lagoons can be used for the final treatment of the effluent before discharge into receiving water. The ideal method of treating water in an anodizing plant is for reuse within the plant. Sludge should be dewatered and disposed of at a landfill. Disposal of the effluent into surface waters requires an equalization tank and filtration systems. (Orr-FIRL)
W75-11378

METHOD OF PURIFYING WATER,
S. R. Kennedy.
Canadian Patent 968,893. Issued June 3, 1975. Patent Office Record, Vol 103, No 22, p 85, June, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Potable water, *Neutralization, Iron, Aluminum.
Identifiers: Acidification, *Chemical treatment.

The patented method described may be used for purifying sewage or other polluted water to render it suitable for use as drinking water. The polluted water is acidified with a mineral acid such as sulfuric, nitric, hydrochloric, or mixtures thereof. This mixture is then treated with iron to produce an iron salt in situ, then neutralized. An iron or aluminum nitrate or sulfate may be added to the mixture when it is treated with the iron. (Orr-FIRL)
W75-11379

LARGE DIAMETER SUBMARINE STEEL PIPELINE CROSSINGS,
Greater Vancouver Sewage and Drainage District. (British Columbia)
For primary bibliographic entry see Field 8A.
W75-11380

CONTINUOUS TREATMENT OF POLLUTED LIQUIDS.
Australian Patent 460, 875. Issued May 8, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 15, p 1690, May, 1975.

Descriptors: *Patents, *Waste water treatment, *Flocculation, Sedimentation, Sludge.
Identifiers: *Bioflocculation, Continuous treatment.

A method for the continuous treatment of polluted liquids has been patented. The liquid is first subjected to a bioflocculation process in a closed space. Part of the liquid along with the formed suspension is continuously removed and allowed to sediment by gravitation in an inclined sedimentation channel. A first stream of liquid with a diluted suspension is taken from the external part of the sedimentation channel for filtering through a perfectly fluidized sludge blanket. A second stream of the suspension concentrated by gravity is passed from the internal part of the sedimentation channel back into the bioflocculation chamber. The liquid which as passed through the sludge blanket is removed for further treatment. (Orr-FIRL)
W75-11381

VACUUM SYSTEM FOR SEWAGE DISCHARGE IN KREMPEL (DISTRICT OF DITHMARSCHEN)-EXPERIENCE WITH A NEW KIND OF SEWERAGE (VAKUUMENTWAESSERUNG KREMPEL/DITHMARSCHEN- ERFAHRUNGSBERICHT UEBER EINE NEUARTIGE KANALISATION),
H. Drebes, and H. Ivers.
Wasser und Boden, Vol 27, No 5, p 115-118, May, 1975. 4 fig, 2 tab, 2 ref.

Descriptors: *Sewers, Waste disposal, Pumps, Storm runoff, Overflow, Personnel, Construction materials.
Identifiers: *Vacuum sewers, Waste discharge, Germany.

The new vacuum sewer system in Krempel, a village of 500 inhabitants in the district of Dithmarschen, West Germany, is described. Due to the lack of sufficient slopes, a vacuum system including waste water pumps, two vacuum pumps, collection tanks, and PVC pipes cost about 50% of a conventional gravitational system. Storm runoff is not provided for, and the storage capacity of the vacuum sewer system is limited. Emergency overflow is not possible. The valve-controlled connection shafts are 80 cm in diameter and 150 cm in height. All repair and maintenance work must be done by trained personnel to avoid damages and breadkown. (Takacs-FIRL)
W75-11383

THE SPACE/TIME COEEFFICIENT METHOD FOR CALCULATION OF RAINWATER RUNOFF (DAS RAUMZEITBEIWERTVERFAHREN FUER DIE BERECHNUNG VON REGENWASSERABFLUESSEN),
H. Schulz.
Wasserwirtschaft-Wassertechnik, Vol 25, No 3, p 99-101, March, 1975. 2 fig, 1 tab, 4 ref.

Descriptors: *Sewers, Runoff, Model studies, Mathematic studies, Hydraulics, Rainfall intensity.
Identifiers: Space/time coefficient.

The space-time coefficient method is a simple model for the approximate calculation of runoff retardations in sewer systems. The space-time coefficient method is based upon Fantoli's mathematical-hydraulical formulas, and represents a generalized simplification of the partial and total retention and translation relations of individual runoff curves. The highest obstruction-free runoff in the sewer system is generated by rainfalls whose duration equals the filling time of the sewer system. More prolonged rainfalls cause either obstruction or runoff under pressure after the filling time. The space-time coefficient curves are based on a computed rainfall for a frequency of n = 1 at a rainfall duration of 45 minutes. (Takacs-FIRL)
W75-11384

PROCESS FOR TREATING WASTE WATER,
Etudes et Procedes d'Assainissement Purator, Rennes (France). (assignee).
S. O. R. L. Lewandowski, and R. Lewandowski.
United States Patent 3,883,426. Issued May 13, 1975. Official Gazette of the United States Patent Office, Vol 934, No 2, p 737, May 1975.

Descriptors: *Patents, *Waste water treatment, Aluminum, Mercury, *Flotation, Water purification.
Identifiers: Alumina, Hydrogen gas.

A process for the purification of waste water has been issued a patent. The process involves mixing waste water and aluminum in a flotation zone. The flotation zone should have an amalgam of aluminum and mercury on at least one surface. The waste water is allowed to react with the amalgam to form hydrogen gas and alumina. Impurities are carried to the surface of the waste water by the evolved hydrogen gas and alumina and removed. The purified waste water is then recovered. (Orr-FIRL)
W75-11387

AN EVALUATION OF THE EFFECTIVENESS AND APPLICABILITY OF PHYSICAL-CHEMICAL TREATMENT OF URBAN LAND RUNOFF,
North Carolina State Univ., Raleigh.
P. Samar.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No 75-7712. PhD Thesis, 1974. 169 p.

Descriptors: *Waste water treatment, *Storm runoff, *Sludge, *Coagulation, *Alum, Design criteria, Urban runoff, Suspended solids, Chemical oxygen demand, Turbidity.
Identifiers: *Physico-chemical treatment.

Urban runoff was treated by a physico-chemical method of coagulation, flocculation, and sedimentation. Sludge handling was also developed, and sludge characteristics were evaluated by density, resistivity, and solid content of the sludge. The selection of an effective coagulant for physico-chemical treatment was investigated by assessing the parameters involved and by evaluating the criteria for effecient treatment. The parameters effective in the design were shown to be directly related to the type of coagulant used. Several organic and inorganic coagulants were evaluated in jar test analyses. The most efficient coagulants in terms of suspended solids removal, COD, and turbidity were found to be alum and the cationic polyelectrolyte Calgon 2660. Based on the parameters of initial suspended solids, alkalinity, and mixing conditions, alum was selected as the best coagulant for treatment of urban runoff. (Prague-FIRL)
W75-11389

ENVIRONMENTAL CONSTRAINTS CHALLENGE DESIGNERS OF SHORELINE COMMUNITY NEAR KANSAS CITY, MISSOURI,
Larkin and Associates, Kansas City, Mo.
G. C. Gray.
Professional Engineer, Vol 45, No 6, p 42-44, June, 1975.

Descriptors: *Waste disposal, *Sewage disposal, *Pumps, Planning, Recreation facilities, *Waste water treatment, Missouri.
Identifiers: *Pressure sewers, *Gravity sewers, Kansas City(Mo).

Waste disposal in a planned community near Kansas City, Missouri had been accomplished by septic tanks, with absorption field effluents being pipelined to a recreational lake. In 1917, planners decided to develop an alternate disposal method which would protect the Lake Weatherby quality, involving a sanitary sewer system. When a gravity sewer system with ultimate treatment at the Kansas City treatment facility was considered, project costs were found to be too high. A vacuum type sewer system would not be effective in waste treatment for this particular topographic condition. A pressure sewer system was then chosen, featuring small size pressure main lines constructed along the street rights-of-way, following the street profile at a shallow uniform trench depth, with a pump unit at each home, pumping into the main pressure line. The pump units consist of an integral grinder and are installed in an opening about four feet in diameter and five feet deep. The final design was a cost effective pressure sewer system constructed of SRD-26 (160 psi rated) PVC pressure pipe. The project included 309 grinder pump units, 35,000 linear feet of main pressure sewers, 37,100 linear feet of pressure service lines from pumps to street mains, 42 air relief valves, 24 flushing and cleanout connections, and 5300 linear feet of eight-inch gravity sewer for connection to existing Kansas City interceptor sewers. (Prague-FIRL)
W75-11392

SUFFICIENT WATER SUPPLY AND SEWER SYSTEM, AND EQUITABLE DISTRIBUTION OF THE COSTS (TILLSTREKKELIGE VANN- OG KOLAKKANLEGG-SAMT RETTFERDIG FORDELING AV KOSTNADENE),
C. Smits.
Teknisk Ukeblad-Teknikk, Vol 122, No 15, p 41-42, April, 1975. 6 refs.

Descriptors: *Sewers, *Waste disposal, *Costs, Water pollution control, Water supply, *Pollution taxes(Charges).
Identifiers: *Sewer use charges, *Norway, Waste water discharge.

The new Water and Wastewater Fee Act, promulgated on January 1, 1975 in Norway, is described. A uniform fee system was designed to provide for a sufficient and dependable water supply, and to set the water and sewage fees to cover their respective costs, as well as to promote economization. Payment shall be for the actual, metered consumption. The sewage fee to be paid will be determined on the basis of water consumption, assuming that the volume of the water consumed is equivalent to that of the waste water discharged into the sewer system. Special discounts will be available for users with installations providing water economy, as compared to conventional systems, and for those users who discharge waste water with very low pollution levels. (Takacs-FIRL)
W75-11393

SEWAGE OXIDATION TREATMENT APPARATUS,
R. N. E. Edwards.
Netherlands Patent 75740V/43. Issued March 4, 1975. Derwent Netherlands Patents Report, Vol W, No 12, p 3, April 29, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Oxidation, Oyxgen, Liquid wastes, Absorption.
Identifiers: Waste oxidation, Chemical oxidation.

A patent was granted to a liquid sewage and waste oxidation system. The apparatus is used for chemical oxidation of contaminants having a high degree of oxygen absorption and utilization. It is composed of an enclosed vessel divided into lower and upper portions. Inlet means for receiving liquid sewage wastes define a liquid level, and outlet means for discharging the treated liquid are found in the lower portion. Means are connected to the vessel to supply oxygen to the upper portion of the vessel. An oxygen rich atmosphere results, above the liquid level. A comminutor in the upper portion directs a stream of liquid sewage from the lower portion upward, to exit into the oxygen atmosphere. At the comminutor, the liquid waste is broken into a myriad of particles, thus increasing the interfacial area between the oxygen and sewage, where oxygen may then be readily absorbed. (Prague-FIRL)
W75-11395

ACTIVATED SLUDGE SEWAGE TREATMENT FOR SEASONALLY VARIABLE THROUGHPUT,
F. Ostreicher.
Belgian Patent 16070W/10. Issued February 3, 1975. Derwent Belgian Patents Report, Vol W, No 10, p 2, April 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Activated sludge, *Biological treatment, Facilities, Sewage treatment.
Identifiers: Sludge quantity(Seasonal), Stock tank.

An activated sludge sewage treatment method was patented which is applicable to treatment of seasonally variable throughout, and may be sustained in low seasons with supplemen ary waste matter. In this biological treatment plant, sewage is delivered into an activated sludge tank which will discharge a treated effluent. When the rate of sewage delivery is too low to sustain an adequate activated sludge level, supplementary sludge is infed from a stock tank. The tank is kept filled when there are periods of excess sludge in the activated sludge tank. The activated sludge tank may be preceded by a decantation chamber and any deficiency in sewage supply is then made up by agitation of sediment in the decantation chamber, which causes suspended sediment to be carried over to feed the sludge tank. (Prague-FIRL)
W75-11396

SEPARATING IONISED MATERIALS FROM AQUEOUS SOLUTIONS.
German Patent 85847V/50. Issued March 27, 1975. Derwent German Patents Report, Vol W, No 14, p 2, March, 1975.

Descriptors: *Patents, *Waste water treatment, *Heavy metals, *Separation techniques, Ionization, Aqueous solutions.
Identifiers: Osmolarity.

A patented method suitable for treating freshwater, seawater, or waste water containing heavy metals is described. Ionized materials of differing chemical or physical properties are separated from aqueous solutions containing at least 0.5 mM mg and/or Ca and K by contact with small bubbles formed by complex-former containing living cells. Complex formers are admitted through the cell walls from a complex former absorbing solution, having an osmolarity below that of the contained cells. The osmolarity of the complex former containing solution is then increased by addition of osmolytically active materials such as Ca, K, and Na ions. Bubbles containing complex former are separated and added to an aqueous solution, until the ionizing materials migrate through the bubble membrane into the bubble. The ionizing materials are thus converted into complexes which dissolve or dissociate with difficulty. The cell bubbles are then separated from the aqueous solution. (Prague-FIRL)
W75-11397

SEWAGE TREATMENT.
French Patent 53421U/37. Issued February 7, 1975. Derwent French Patents Report, Vol W, No 12, p 10, January, 1975.

Descriptors: *Patents, *Sewage treatment, *Aeration, *Waste water treatment, Sedimentation, Separation techniques, Sludge treatment, Facilities, Activated sludge.
Identifiers: *Package treatment plants, Waste purification.

A package plant for treatment of sewage was patented. The plant is divided into separate aeration, stabilization, and sedimentation chambers. A digestion cavity is positioned beneath the stabilization chamber. Raw sewage and settled sludge from the stabilization chamber are introduced into the aeration chamber. Sewage solids are converted into a liquid suspension of activated sludge flocs. These are directed to the sedimentation chamber for separation. The separated solids then pass to the stabilization chamber and purified liquid is removed from the sedimentation chamber. (Prague-FIRL)
W75-11398

SINGLE TANK SEWAGE TREATMENT PLANT,
J. R. Kaelin.
German Patent 15826U/12. Issued February 27, 1975. Derwent German Patents Report, Vol W, No 10, February 27, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Tanks, Control structures, *Treatment facilities.
Identifiers: *Liquid turn-over device(LTD), Waste clarification.

A patent was issued for a single basin sewage clarification plant. This single tank installation has a liquid turn-over device (LTD) with two openings, an upwardly directed suction opening and a downwardly directed outflow opening. One or more supply lines for the feed of an oxygen-containing gas mixture terminates in the immediate suction region of the LTD. Control devices prevent a lowering of the liquid level below the level of the suction opening. Conveyor paddles are fitted at their leading edges with cutting edges and produce shear action. The paddles have a plane running vertically to the axis of rotation of the LTD. A simple LTD of non-adjustable height is reliable, almost noiseless, and provides sufficient turn-over and oxygen supply to even the lowest liquid layer. (Prague-FIRL)
W75-11399

PROPOSED STANDARDS: LAND DISPOSAL OF EFFLUENTS,
University of South Florida, Tampa. Dept. of Biology.
J. V. Betz.
Civil Engineering, ASCE, Vol 45, No 5, p 77-79, May, 1975.

Descriptors: *Waste water treatment, *Waste disposal, Effluents, Pre-treatment, Land management, Sewage treatment, Economics, Groundwater, *Water quality standards, Percolation.
Identifiers: Land disposal, Land application.

Advantages and areas of concern for and disposal of effluents are discussed. When proper pre-treatment is given to sewage effluent, thus eliminating nitrates, toxic metals, detergents, and pathogenic bacteria, the resulting effluent may be used to irrigate the soil and crops. Purification then takes place, encompassing: nutrient uptake capacity of vegetative cover; biochemical reactions caused by microorganisms in the soil; inorganic chemical absorption to some extent by non-living soil constituents; and, mechanical filtering effects of passing through the soil. Advantages of this type of land disposal include: pollutants being kept from surface waters; sewage water providing crop and vegetation fertilizer; nutrients being recycled back into the soil and water being recharged back into the ground. In addition, the process is more economical than advanced waste treatment. However, the quality of groundwater is threatened when land disposal is not properly regulated or enforced. Examples occur if: septic tanks are not properly installed and permit aquifer contamination; sewage sludge disposed of in landfills is not monitored; drainage wells dispose of unwanted stormwater from farmlands, streets, and polluted lakes, as well as some sewage plants; open dump leachate seep into groundwater; canals and flood control channels cut into underlying aquifers and permit salty or polluted water to contaminate groundwater; or if sewage treatment plant effluents are disposed of in lagoons, percolation, or evaporation ponds, and then seep underground. (Prague-FIRL)
W75-11400

GREEN SYSTEMS FOR WASTEWATER TREATMENT.
Environmental Science and Technology, Vol 9, No 5, p 408-409, May, 1975. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Water treatment, Aquiculture, Treatment facilities, Precipitation(Chemical), Spraying, Irrigation, Water reuse, Nutrient removal, Water quality control.
Identifiers: *Living filter concept, Biological systems, Secondary treatment, Rhine River, Blue Nile River, Spray irrigation.

Biological techniques may be successfully applied to the treatment of water and waste water. Such methods were described at the International Conference on Biological Water Quality Improvement Alternatives, held this spring at the University of Pennsylvania in Philadelphia. Traditional water treatment is achieved on a household scale in the Sudan where water from the Blue Nile is flocculated and clarified in a 20 liter jar with pounded seeds of the tree Moringa olifera. At the Krefeld water treatment facility in West Germany, polluted Rhine river water is given secondary treatment (following primary treatment) by pumping the water through the reeds to precipitate solids; sludge is then aerated and sprayed into a lagoon containing bulrushes. These bulrushes neutralize extreme pH values, reduce COD, and increase DO. Tertiary treatment may then follow by filtration through natural sand and gravel. In Holland, a similar reed-bulrush-polypropylene fiber system was developed. At Penn State University, waste water reuse with spray irrigation of treated municipal sewage effluent to a mixed hardwood forest has been practiced for twelve years. Called 'the living filter concept', this system is recommended as efficient and economical for small cities and suburbs with available land. At Woods Hole, Massachusetts, marine aquiculture systems are being considered for removal of nutrient-rich wastes, and perhaps to provide a new commercial crop. Other biological techniques suggested include the use of biological 'filters', such as fresh water plants, invertebrates, and fish to control influent pH, and to improve organic, mineral, and bacteriological water quality. (Prague-FIRL)
W75-11401

STUDIES OF THE BIOCHEMICAL FACTORS CONTROLLING THE FLOCCULATION OF ACTIVATED SLUDGE, (IN JAPANESE),
Y. Magara, and Y. Nanbu.
Gesuido Kyokaishi, (Jour. of the Japanese Society of Sewerage), Vol 11, No 126, p 5-11, 1974. 20 ref.

Descriptors: *Activated sludge, *Flocculation, *Sewage treatment, *Waste water treatment, Sedimentation, Organic matter, Efficiencies.
Identifiers: External cellular parts(ECP), Poly-beta-hydroxybutyric acid.

Flocculation and sedimentation of activated sludge in sewage water treatment were studied in relation to poly-beta-hydroxybutyric acid (PHB) produced within cellular parts of microorganisms in the activated sludge particles, organic matter produced at external cellular parts (ECP), and the electrophoresis value of solution. Three different types of the Pasveer's artificial sewage water were used. These were 0.135, 0.350, and 0.750 kg BOD/kg MLSS day. Both PHB and ECP levels decreased with increased average TOC staying time, and the absolute electrophoresis value of solution increased with the decreased PHB and ECP levels. Since the ECP are considered to have a carbonyl group, the sludge particles have negative charges and the electrical repulsive force between particles increases with higher ECP level, causing lowered flocculation and sedimentation. Thus the ECP was thought to be the main factor responsible for the efficiency of flocculation. Flocculation and sedimentation become poorer with higher concentrations of organic matter in the sewage water. This is explained from the fact that the average TOC staying time decreases since the average sludge staying time shortens with more organic matter per unit weight of activated sludge. (Katayana-FIRL)
W75-11402

FINAL DISPOSAL OF MUNICIPAL SLUDGE IN SWEDEN,
National Swedish Environment Protection Board, Stockholm. Research Lab.
For primary bibliographic entry see Field 5E.
W75-11403

THE PHYSICO-CHEMICAL TREATMENT OF CRUDE SEWAGE,
J. McKendrick, and E. R. Swart.
Water Pollution Control, Vol 74, No 2, p 155-159, 1975. 4 tab, 6 ref.

Descriptors: *Pilot plants, *Waste water treatment, *Sewage treatment, Activated carbon, Alum, Clarification, Filtration, Ammonium.
Identifiers: *Physico-chemical treatment, Crude sewage, Nitrogen removal, Zeolites, Clinoptilolite, *Rhodesia.

A pilot plant for physico-chemical treatment of crude sewage is being planned in Rhodesia. This

process is designed to overcome some of the problems of the land irrigation of final effluents, especially for this type of area which has seasonal rainfall, and relies on storage dams for adequate water supply. In addition, physico-chemical processes can be more immediately corrected for changes in sewage quality than can biological ones. The proposed method consists of flocculation of raw sewage with alum, clarification, sand filtration, and activated carbon treatment. Ammonia and total nitrogen removal from the activated carbon effluent presents the greatest problem. Laboratory trials resulted in 99.7% ammonia removal with the use of the naturally occurring zeolite clinoptilolite. This level is well below Rhodesian Water Pollution Regulations, but use of this treatment depends upon whether natural clinoptilolite can be found in Rhodesia or whether a resin with similar characteristics can be economically synthesized. (Prague-FIRL)
W75-11404

AMMONIA REMOVAL FROM MUNICIPAL WASTEWATERS BY ION EXCHANGE,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
J. H. Koon, and W. J. Kaufman.
Journal Water Pollution Control Federation, Vol 47, No 3, p 448-465, March, 1975. 14 fig, 9 tab, 23 ref.

Descriptors: *Ion exchange, Economics, *Ammonium, *Waste water treatment, Municipal wastes, Costs.
Identifiers: *Zeolites, *Clinoptilolite.

The conditions under which the zeolite ion exchanger clinoptilolite is most effective and economical for ammonia removal from waste waters were investigated. Experimental results were cited for defining optimum operating parameters for clinoptilolite exchangers and for estimating the cost of ammonia removal with clinoptilolite. It was found that the ammonium exchange capacity of clinoptilolite in domestic waste water treatment may be estimated from the cationic strength of the column influent. While total ammonium exchange capacity for Na- and Ca-clinoptilolite were identical, breakthrough capacity was more than two times as great for Na-clinoptilolite, probably because of the greater mobility of the smaller sodium ion in the zeolite pores. The total cost for ammonium removal with clinoptilolite for a 10 mgd plant was estimated to be $0.101 per 1000 gallons when regenerant is reused and $0.163 per 1000 gallons when regenerant is used only once. (Prague-FIRL)
W75-11405

INSTRUMENTAL INVESTIGATION OF BIOLOGICAL WASTE WATER TREATMENT (A SZENNYVISEK BIOLOGIAI TISZTITASANAK MUSZERES VIZSGALATA),
S. Fekete.
Kemiai Kozlemenyek, Vol 42, p 277-283, 1974.

Descriptors: *Instrumentation, *Biological treatment, *Waste water treatment, Phenols, Oxidation, Measurement, Biodegradation, Analytical techniques, Pollutant identification.
Identifiers: *Electrolytic cells.

A method and an automatic instrument for the measurement of the respiration of bacteria as a parameter of biological waste water treatment are described, as well as measurement data concerning the biodegradation of phenol in waste water. The instrument is composed of a closed reactor vessel with carbon dioxide absorber for the activated sludge sample, and a communicating electrolytic cell with properly profiled electrolytes for oxygen generation as a function of the respiration intensity of the bacteria. The respiration intensity is measured as the current intensity of the electrolytic cell. Measurements in phenol-contaminated waste water revealed a prolonged adaptation period preceding the aerobic microbial oxidation of phenol. The adaptation time increases with the phenol concentration in the waste water, and with the phenol load of the activated sludge. The oxidation peak was demonstrated to be in proportion to the phenol concentration. (Takacs-FIRL)
W75-11407

AN AUTOMATED SPECTROPHOTOMETRIC SUSPENDED SOLIDS ANALYSIS FOR ACTIVATED SLUDGE,
Municipality of Metropolitan Seattle, Renton, Wash. Renton Treatment Plant.
R. E. Finger, and B. J. Strutynski.
Journal Water Pollution Control Federation, Vol 47, No 5, p 1043-1054, May, 1975. 11 fig, 4 tab, 15 ref.

Descriptors: *Activated sludge, *Biological treatment, *Suspended solids, *Waste water treatment, Colorimetry, Automation, Sampling, Measurement, Analytical techniques, *Pollutant identification, *Spectrophotometry.
Identifiers: *Sludge volume index.

The measurement of suspended solids (ss) concentration in biological waste treatment is used as a primary control for process adjustment. The ss measurement is necessary for calculation of cell residence time, organic loading, and sludge volume indexes. The determination of types of polysaccharides associated with activated sludge and their effects on the physical characteristics of sludge have been investigated by a simple colorimetric test. The purpose of this study was to consider the possibility of adapting this test to an automated procedure. A manual colorimetric procedures which takes two or three hours was first tested and it proved to effectively measure mixed liquor suspended solids and vss. The automated spectrophotometric ss test takes only fifteen minutes and was demonstrated to be practical for use on a continuous basis. The major problem with the technique is sampling, which may be improved by the installation of a homogenization system. (Prague-FIRL)
W75-11408

THE USE OF COMPUTERS FOR FORECASTING THE SANITARY SYSTEMS OF WATER BODIES (PRIMENENIYE EVM DLYA PROGNOZIROVANIYA SANITARNOGO SOSTOYANIYA VODOYEMOV),
Ya. I. Vaysman, N. V. Zaytseva, B. M. Krasovskiy, and A. V. Mikhaylov.
Gigiyena i Sanitariya, No 9, p 102-104, 1974.

Descriptors: *Computers, Surface waters, *Forecasting, Hydrologic aspects, Water treatment, *Waste water treatment, *Pollutant identification.
Identifiers: Waste discharge, *USSR.

A computerized method for forecasting the sanitary status of surface water bodies is presented. Factors characterizing the dynamics of waste water discharges and their quantitative and qualitative parameters during the investigation period, the technological water treatment measures to be taken for pollution abatement, as well as the dynamics of the hydrological parameters of the water body were chosen as input data. The algorithm elaborated permits the determination of the concentration of one or more pollutant components as a function of time and of the size of the water body. It also determines the probability of the occurrence of definite pollutant concentrations. The algorithm was tested for the chloride load of the Kama river in the USSR. (Takacs-FIRL)
W75-11410

BREAKTHROUGH IN SEWAGE TREATMENT--CASH, LAND, AND ENERGY SAVED.
Water Services, Vol 79, No 650, p 132, 140, April, 1975. 3 fig.

Descriptors: *Waste disposal, *Pilot plants, Effluents, *Sewage treatment, Biological treatment, Municipal wastes, Industrial wastes, *Waste water treatment.
Identifiers: *Underground disposal, *Deep Shaft Effluent Treatment Process.

A method of underground treatment of both municipal and industrial effluents has been developed which will reduce the size of sewage works in half, operate them at lower costs, and produce 50% of the present amount of sludge. Called the ICI Deep Shaft Effluent Treatment Process, the basis of the system is a shaft hundreds of feet deep, partitioned into two sections. A pilot plant has been operated successfully since mid-1974 by the Northumbrian Water Authority, in Great Britain. In the process, sewage effluent enters the shaft continuously, is circulated through the sections of the shaft several times, then overflows by gravity for separation of solids. Biological oxidation is promoted by the compressed air that is also the driving force for the circulating the liquid effluent. The depth of the shaft determines the efficiency of oxygen transfer. Conventional drilling techniques are used for construction of the system. In all but optimal geological conditions, the hole must be lined with either concrete or steel and the annulus between the lining and the rock must be pressure grouted or filled with cement grout, because the lining carries the load from the rock and the hydrostatic heads. ICI recommends their process as a land-saving method for use in densely populated areas, and for treatment in cold climates where slow treatment rates have been a persistent problem. (Prague-FIRL)
W75-11413

STORM AND COMBINED SEWER ABATEMENT TECHNOLOGY IN THE UNITED STATES--AN OVERVIEW,
Environmental Protection Agency, Washington, D.C. Municipal Pollution Control Div.
F. J. Condon.
In: 3rd U.S.-Japan Conference on Sewage Treatment Technology, February 12-16, 1974, Tokyo, Japan, p 505-546. 4 fig, 16 tab.

Descriptors: *Storm runoff, *Urban areas, *Combined sewers, Sewerage, Waste discharge, Treatment, Urban hydrology, Effluents, Water pollution control, Mathematical models, *Waste water treatment, United States.
Identifiers: Non-point pollution sources, Storm Water Management Models.

An overview of principal sources of runoff induced pollution as investigated by the Office of Research and Development of the United States Environmental Protection Agency is given. These include: combined sewer (domestic sewage and runoff) overflows, sewered storm water discharges, sanitary sewers surcharged by infiltration, treatment works or pump station bypass, and urban non-point or overland runoff. Remedial solutions for these specific causes must include urban hydrology as well as sanitary engineering. Schematic diagrams of urban hydrologic systems have been developed. In evaluating water pollution loading, strength and mass emission of pollutants from an event must be considered. Projects for control include quantity reduction (infiltration control), quality improvement (deicing methods), runoff rate attenuation (porous pavements), and improved materials (electro-magnetic subsurface profiling) for urban areas. Possible alternatives for effluent management facilities are also detailed. Treatment may be physical, physico-chemical, biological, or biophysical. The well-developed mathematical Storm Water Management Model and associated work are outlined as the prime tools for use in application of a total system con-

cept for selecting water pollution control alternatives. (PraguenFIRL)
W75-11414

ELIMINATION OF WATER SURFACE POLLUTION.
Australian Patent 458,317. Issued February 27, 1975. Official Journal of Patents, Trade Marks, and Designs, Vol 45, No 6, p 542, February 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Organic wastes, Pollutants, Organic wastes.
Identifiers: *Chemical treatment.

A patent has been issued for a composition that can be used for the elimination of water surface pollution. The composition is in a granular or powdered form and is suitable for concentrating organic pollutants on the surface of a body of water. The components of the composition include a carrier having an apparent density of less than one g/cc, a wetting agent consisting of a mono or polyhydric alcohol, and a surface active agent having a hydrophilic group other than a hydroxyl group. In each 100 parts by weight of the three components, there are 10-90 parts carrier, 1-10 parts wetting agent, and 9-80 parts surface active agent. (Orr-FIRL)
W75-11416

VALVE FOR CONTROLLING LIQUID DISCHARGE.
For primary bibliographic entry see Field 8C.
W75-11417

FILTRATION AND PURIFICATION OF CONTAMINATED WATER,
A. Schreiber, B. Schreiber, and E. Schreiber.
Canadian Patent 959,980. Issued December 24, 1974. Patent Office Record, Vol 102, No 52, p 85, December 24, 1974.

Descriptors: *Patents, Filtration, *Waste water treatment, *Trickling filters, Sludge treatment, Waste disposal, Water purification.
Identifiers: Waste discharges.

A process for the filtration and purification of contaminated water by means of a trickling filter was patented. A wear-resisting filler material having a specific gravity of approximately one or below is employed. Sludge adhering to the filler material is removed by first filling the material with flushing or scavenging water, then agitating the filler material, sludge, and added water. During agitation, the greater part of the sludge is discharged, mixed with water. The flushing water is then discharged, along with any sludge it contains, after which the trickling filter may be utilized again. (Prague-FIRL)
W75-11418

OPEN WATER PURIFICATION SYSTEM,
J. Rafael.
French Patent 32834V/18. Issued August 2, 1974. Derwent French Patents Report, Vol 40, No 3, p 3, November 12, 1974.

Descriptors: *Water purification, *Patents, *Oil spills, Water treatment, Plastics, Tanks, *Flocculation, Separation techniques.

An open water purification system was patented. The system is versatile and has a high treatment capability, such as for the cleaning up of oil slicks. Two positions are used with their internal tanks coupled by an elongated flexible plastics walled duct. The duct acts as a flocculation dwelling chamber for raw water, taken in at the bow of the first position, and mixed in the tank of that position with a flocculating agent injected into it from an on-board preparation tank. The second position contains a separation system for the precipitated sludge and an aft discharge port for the treated water. (Prague-FIRL)
W75-11419

USE OF OXIDIZED CATIONIC STARCH IN FLOCCULATION AND DEWATERING OF MUNICIPAL SLUDGE,
Anheuser-Busch, Inc., St. Louis, Mo. (assignee)
W. G. Hunt, and R. J. Belz.
United States Patent 3,875,054. Issued April 1, 1975. Official Gazette of the United States Patent Office, Vol 933, No 1, p 338, April 1975.

Descriptors: *Patents, *Sewage treatment, *Sludge treatment, *Flocculation, *Waste water treatment, Municipal wastes, Sewage sludge.
Identifiers: *Starches.

A method was patented for treating raw primary sedimented sewage sludge. Its steps include the addition of from 0.016% to 0.1875% by weight (based on the dry weight of the sludge) of gelatinized oxidized cationic starch ether of amine butene halide to the raw sludge. The starch ether should have a carboxyl content equivalent to a degree of substitution of 0.0036 to 0.0108 and a degree of substitution of amine butene halide of about 0.15 to 0.25. The sludge is flocculated and then dewatered to below about 70% moisture. (Prague-FIRL)
W75-11420

WATER PROCESSING PLANT TO CONTROLLED ACIDITY LEVEL,
For primary bibliographic entry see Field 5F.
W75-11421

ELECTROLYTIC CHLORINE USED TO PURIFY DISINTEGRATED SEWAGE.
Belgian Patent 1442W/09. Issued January 16, 1975. Derwent Belgian Patents Report, Vol W, No 9, p 2, April 8, 1975.

Descriptors: *Waste water treatment, *Patents, *Biological treatment, Suspended solids, *Sewage treatment, Bacteria, Biochemical oxygen demand, Odors, Chemical oxygen demand.
Identifiers: *Electrolytic chlorine, Sewage purification.

A patent was granted for electrolytic chlorine used to purify disintegrated sewage. Sewage containing a chloride of an alkali metal in solution is run into a first chamber. There suspended solids are broken down by a high speed disintegrator while an immersed anode and cathode subject the liquid to electrolysis evolving chlorine. The treated liquid suspension is transferred to a second chamber to be further mixed by an agitator before discharge from an outlet. Electrolysis should be continued in the second chamber. The system may be used in the purification of waste water or sewage to reduce the BOD, the COD, bacteria, and malodors to a level acceptable for discharge to rivers, canals, lakes, or the sea. (Prague-FIRL)
W75-11422

FILTER FOR PURIFICATION OF WASTE WATER.
an Patents Report, Vol 5, No 46, p 2, October 1974.

Descriptors: *Waste water treatment, *Patents, *Filters, Sludge, Microorganisms, Aeration, Filtration.

A filter was patented for the physical and/or biological purification of waste water. The sewage or waste water is allowed to trickle for a limited period over the filter bed, thus building up a layer of sludge and microorganisms. Grains covering the filter bed are circulated periodically and the sludge removed. To increase the efficiency of this sludge removal process, the waste water is distributed uniformly over the whole of the filter bed by rotating distribution arms. The grains, with diameters of about 6 mm are kept in a reservoir, resting on a concrete base. Arms for washing and sludge recovery rotate around two pipes; one admits compressed air and the other evacuates sludge. The biological layer of the grains is thus aerated and the circulation of the filter grains prevents clogging. (Prague-FIRL)
W75-11423

SLUDGE DEWATERING INSTALLATION.
Netherlands Patent 74332V/43. Issued October 23, 1974. Derwent Netherlands Patents Report, Vol 5, No 45, p 3, December 1974.

Descriptors: *Patents, *Sewage treatment, *Dewatering, *Sludge treatment, Drainage, *Waste water treatment.

A patent was granted to a sludge dewatering installation. Straining tanks are used for dewatering industrial wastes, municipal wastes, or sewage and consist of skips with sloping sides, lined throughout with wire mesh grilling. These are supported so as to leave space for drainage to bottom outlets, from the surface of settling sludge. The skips are easily transportable by skip-lorries, to dumping or disposal sites. This eliminates manual transfer from tank to transport. The installation is economical in terms of site space required, and may be located at the sludge source. (Prague-FIRL)
W75-11424

WASTE WATER TREATMENT SYSTEM WITH AN OZONE GENERATOR,
S. Koigawa, and M. Furuse.
Japanese Patent 49-27714. Applied March 4, 1970. Issued July 27, 1974. Japan Model Utilities. 1 fig.

Descriptors: *Waste water treatment, *Ozone, *Patents, Equipment, Mixing.
Identifiers: *Ozone generator, Mixing efficiency.

A waste water treatment apparatus equipped with an ozone generator was patented. The ozone generator is enclosed within the reaction bath of the apparatus and is thus cooled effectively by the surrounding waste water. The generated ozone is collected at the top of the generator and bubbled through from the bottom of the reaction bath. Spiral fines are attached outside of the ozone generator, which increases the mixing efficiency between ozone and the waste water. (Katayama-FIRL)
W75-11426

DOMESTIC WATER PURIFICATION METHOD AND SYSTEM,
Inca-One Corp., Los Angeles, Calif. (assignee)
J. D. Zeff.
United States Patent 3,843,521. Issued October 22, 1974. Official Gazette of the United States Patent Office, Vol 927, No 4, p 1637, October 1974. 1 fig.

Descriptors: *Patents, *Ozone, *Water purification, Domestic water, Equipment, *Waste water treatment.
Identifiers: *Ozone generator.

A patent was given for a household ozone generator and purification system, used for the purification of small quantities of impure water. It consists of a housing; an ozone generator mounted in the housing; means secured to the housing for energizing the ozone generator for preselected time intervals; and an open topped container with an impeller adjacent to its base. A cap for this open top defines an opening and means for mounting the housing on the cap permit ozone to flow through the cap and into a container. Thus, when the impeller is rotated, ozone is generated and flows into the container, purifying the domestic water. (Prague-FIRL)
W75-11427

REMOVING SOLIDS FROM SEWAGE.
U.S.S.R. Patent SU 407842. Issued December 10, 1973. Soviet Inventions Illustrated, Vol 5, No 41, p 2, September 19, 1974. 1 fig.

Descriptors: *Patents, *Sewage treatment, *Ammonia, Temperature, *Waste water treatment.
Identifiers: Solids removal, Cooling agents.

A patent for a method of removing solids from sewage was issued which involves freezing with a cooling agent such as ammonia and subsequently thawing and reliquifying the ammonia. Energy consumption is reduced by liquifying the cooling agent in two stages using high and low pressure compressors in series. Ammonia is fed along a pipeline to a crystallizer/evaporator where it evaporates, drawing its heat from the sewage residues which have been poured into the vessel and frozen. Ammonia vapor passes along by the low-pressure compressor and condenses from the pressure of boiling ammonia to the pressure of intermediate condensation in the condenser/meter. Heat transfer takes place, and the previously-frozen residues melt. The high pressure compressor removes the vaporous ammonia from the condenser-melter, raising the pressure to that of the high-temperature condenser. Excess heat is transferred from the condensation temperature of the cooling agent to that in the condenser. The result is that the cooling agent liquifies and is once more conveyed by a pipeline into the crystallizer/evaporator and the cycle is repeated. (Prague-FIRL)
W75-11428

BIOLOGICAL PURIFICATION OF TOWN AND INDUSTRIAL EFFLUENTS.
French Patent 11432W/07. Issued December 20, 1974. Derwent French Patents Report, Vol W, No 7, p 3, March 1975.

Descriptors: *Biological treatment, *Municipal wastes, *Industrial wastes, *Waste water treatment, Bacteria, Anaerobic treatment, Secondary treatment, Sludge treatment, Effluents.

A biological purification treatment method was patented which has been applied to rural, municipal, and industrial effluents. The effluent is seeded with bacterial strains, selected according to the nature of the effluent. The wastes are subjected to conditions which allow anaerobic and/or aerobic degradation of the organic matter. The effluent is coarse-screened and transferred to the primary settling tank where it is seeded with freeze-dried bacteria; corresponding natural enzymes and certain wetting agents are added. Anaerobic degradation occurs and after one to three days the effluent is collected from the upper part of the tank by passage along a pipe to an oxidation tank equipped with a projection turbine. After a period of twelve hours to twenty days, according to the degree of pollution, the effluent goes to a secondary settling tank where mineralized sludge is deposited. The treated effluent thus passes out by the overflow. (Prague-FIRL)
W75-11429

IRRADIATION PLANT FOR FLUID MATERIAL, PARTICULARLY SEWAGE SLUDGE.
German Patent 12845W/08. Issued February 13, 1975. Derwent German Patents Report, Vol W, No 8, p 2, February 1975.

Descriptors: *Patents, *Sewage treatment, *Irradiation, *Treatment facilities, *Sludge treatment, *Waste water treatment, Sewage sludge.

A plant for irradiating fluid material, particularly sewage sludge, was patented. Radioactive sources comprise an irradiation chamber through which the material flows. The equipment is provided with a container for a series of radiation sources, having channels for the introduction and withdrawal of these sources, which can be closed off and sealed against the fluid material. A common closure piece is provided for closing the channels and can be pressed down onto the radiation source container by a clamping retaining element. The closure piece is more reliable than individual closure elements and the radiation sources can be exchanged in a much shorter time; the danger that more than one channel is not completely sealed is considerably reduced. (Prague-FIRL)
W75-11430

CONTINUOUS DETERMINATION OF TOXICITY OF EFFLUENTS.
For primary bibliographic entry see Field 5A.
W75-11431

APPARATUS FOR CLEANING LOOSE FILTERING MATERIAL IN SLOW WATER FILLED WATER SUPPLY FILTERS,
For primary bibliographic entry see Field 5F.
W75-11436

FLOTATION AERATOR FOR AERATING AND MOVING WATER,
R. A. Cramer, Jr.
United States Patent 3,865,909. Issued February 11, 1975. Official Gazette of the United States Patent Office, Vol 931, No 2, p 859, February, 1975. 1 fig.

Descriptors: *Patents, *Aeration, *Flotation, Equipment, *Water treatment, *Waste water treatment.
Identifiers: *Flotation aerator.

An apparatus for aerating a body of water was patented. The process consists of propelling a stream of water from the body upward and outward above its surface. A float member of substantial area serves as a support, having through it a central opening with a vertical axis. A ring member is positioned in and encases a central opening and defines a vertical water flow passage. Motor supports are spaced on the ring member. A submersible motor is carried by its supports, spaced below the float member; the motor has a power shaft axially aligned with the flow passage. A propeller and diffuser are used to impinge upon a stream of water and to disperse the water upward and outward over a wide area. (Prague-FIRL)
W75-11439

INCINERATOR DEVICE AND A METHOD OF PROCESSING RESIDUALS IN WASTE WATER, LIQUEFIED SEWAGE AND SLUDGE,
Klein (Albert) KG, Niederfischbach (West Germany). (assignee).
W. Bastgen.
United States Patent 3,871,285. Issued March 18, 1975. Official Gazette of the United States Patent Office, Vol 932, No 3, p 851, March, 1975. 1 fig.

Descriptors: *Patents, *Incineration, *Waste water treatment, Sewage treatment, Equipment, Sludge treatment.
Identifiers: Granulation.

A device was patented for incinerating granulated combustible material. At least one sieve-type grate feeds combustible material; the grate is in the form of a rigid plate-shaped member with spaced perforations. The peripheral outline in each perforation is small in relation to the total area of the plate-shaped area. Supply means continuously feed air to the grate from below, thereby cooling the grate. Residuals are dried preliminarily by applying pressure; the predried residuals are granulated, maintaining a bed of hot air above the grate. The granulate in the form of a layer is guided along the hot air bed, and swinging movements to the layer cause the granulate to dip intermittently into the hot air bed. (Prague-FIRL)
W75-11440

LIQUID TREATMENT PLANT AND PROCESS PARTICULARLY FOR WASTE WATER,
J. E. Chatfield.
Canadian Patent 962,386. Issued February 4, 1975. Patent Office Record, Vol 5, p 82, February, 1975.

Descriptors: *Patents, *Phosphorus, *Waste water treatment, Treatment facilities, Pollutants, Lime, *Coagulation, *Flocculation.

A patent was issued for a treatment process and plant which are adaptable and can be placed within a compact package unit. The process is designed to efficiently remove phosphorus and other pollutants from waste water. In the treatment process, lime or another chemical coagulant is mixed with an influent solution to coagulate the solute and to flocculate the suspended particles in a flocculation chamber. There the mixture is raised through a field of suspended particles and reseeded with deposited particles to encourage the flocculation. The mixture is thus caused to pass through curtains of falling floc and between sedimentation trays to deposit the particles. The unit produces gravity flow serially and at predetermined individual velocities through the successive stages of the process, optimizing its flocculation and deposition conditions. (Prague-FIRL)
W75-11441

SEWAGE TREATMENT WITH HYDROGEN PEROXIDE.
Australian Patent 458, 666. Issued March 6, 1975. Official Journal of Patents, Trade Marks, and Designs, Vol 45, No 7, p 680-681, March, 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Odors, *Patents, Hydrogen sulfide, *Corrosion control, Sulfides.
Identifiers: *Hydrogen peroxide.

A process for treating sewage and sewage systems to remove odors caused by hydrogen sulfide and to reduce corrosion caused by oxides of sulfur has been patented. It involves using hydrogen peroxide to oxidize sulfide and hydrogen sulfide and to control their regeneration or recurrence. The preconditioning treatment is to introduce hydrogen peroxide into the sewage in an amount 4-10 times the stoichiometric equivalent of sulfide and hydrogen sulfide in the influent sewage for a period of time sufficient to reduce the sulfide and hydrogen sulfide levels to essentially zero. The sulfide and hydrogen sulfide are then continuously maintained at essentially zero levels either by introducing hydrogen peroxide into the sewage in the absence of aeration in an amount 1-2 times the stoichiometric equivalent of sulfide and hydrogen sulfide into the sewage while aerating the system with air or oxygen enriched air or oxygen in an amount one-fourth to one times the stoichiometric equivalent of sulfide and hydrogen sulfide in the influent sewage. (Orr-FIRL)
W75-11443

TREATING EFFLUENT.
Australian Patent 459,333. Issued March 29, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 9, p 951, March, 1975.

Descriptors: *Patents, *Sewage treatment, *Plastics, Filtration, *Waste water treatment, Effluents, Aeration.

A method was patented to treat whole raw sewage effluent. The effluent is mascerated, then passed into a vessel of submerged contact media. The media consists of a bed of randomly arranged pieces of plastic material. After the effluent is passed through the media, it is aerated. Treated effluent is then withdrawn from the vessel at a point above the bed. (Prague-FIRL)
W75-11444

REGIONAL SEWERING AND GROUNDWATER QUALITY IN THE SOUTHERN SAN JOAQUIN VALLEY,
K. D. Schmidt.
Water Resources Bulletin, Vol 11, No 3, p 515-525, June 1975. 4 fig, 9 ref.

Descriptors: *Groundwater movement, *Water pollution, *Water quality, *Seepage, *Sewage disposal, *California, Water reuse, Groundwater recharge, Sewage treatment, Chlorides, Chemical analysis.
Identifiers: *San Joaquin Valley(Calif), *Regional sewering, Fresno(Calif).

Sewage effluent is commonly disposed of on land in arid regions, and the majority usually recharges the groundwater. Few evaluations have been made on the effect of effluent disposal on groundwater quality in the west. Groundwater hydrologists are rarely involved with treatment plant design and operation or effluent disposal in the San Joaquin Valley, California. The effect of regional sewering programs on groundwater quality in this valley was evaluated. Research was conducted on past studies of sewage effluent disposal. An extensive water sampling program was undertaken near the Fresno Sewage Treatment Plant. Chloride contents were used to trace recharged effluent. The extent of recharged effluent was delineated and traced for about ten miles. Sampling between the plant and the urban Fresno area indicated a high probability of large-scale leakage of raw sewage into the groundwater. There was demonstrated a need for development of better, smaller sewage treatment plants and individual waste disposal systems. (Lardner-ISWS)
W75-11446

SCALE EFFECTS ON COOLING TOWER MODEL STUDIES,
Iowa Inst. of Hydraulic Research, Iowa City.
For primary bibliographic entry see Field 8B.
W75-11470

GYPSUM SOLUBILITY AND SCALING LIMITS IN SALINE WATERS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 3A.
W75-11473

RESPONSE OF COMPLETELY MIXED ACTIVATED SLUDGE SYSTEMS TO CHANGES IN THE ENVIRONMENT,
Oklahoma State Univ., Stillwater. Center for Water Research in Engineering.
A. F. Gaudy, Jr.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 001, $7.50 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 236 p, 28 fig, 6 append. OWRT A-043-OKLA(1).

Descriptors: *Activated sludge, Temperature, Effluents, Flow rate, Hydrogen ion concentration, Water pollution effects, *Waste water treatment, Microbial degradation, Growth rate.
Identifiers: *Shock loading.

This project was undertaken to analyze experimental results dealing with the response of continuously cultured heterogeneous microbial populations, elg., activated sludge, to step changes in feed flow rate, feed concentration, pH and temperature. The response was characterized by determining preshock, transient stage and final 'steady state' conditions of effluent substrate and cell concentration and biochemical composition of the biomass. Both once-through and cell recycle systems were studied and effect of specific growth rate and mean hydraulic retention time on response were assessed. In general, an increased retention time, cell recycle and biomass concentration lessened the amount of substrate leakage during the transient stage, whereas, a decreased specific growth rate alleviated disruption of plant efficiency. An appendix consists of six papers on these types of shock loading.
W75-11478

WATER QUALITY CHANGES RELATED TO THE DEVELOPMENT OF ANAEROBIC CONDITIONS DURING ARTIFICIAL RECHARGE,
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 5B.
W75-11497

CALICUM SULFATE SCALING IN REVERSE OSMOSIS (HYPER-FILTRATION) OF BRACKISH WATERS BY HOLLOW-FIBER AND SPIRAL-WOUND MODULES,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 3A.
W75-11505

METHOD FOR COMBATTING POLLUTION USING A CHROMIUM COMPLEX,
Seppic, Paris(France). (assignee).
For primary bibliographic entry see Field 5G.
W75-11506

AEROBIC SEWAGE TREATMENT SYSTEM,
Coate Burial Vault, Inc., West Milton, Ohio. (assignee).
K. J. Yost.
United States Patent 3,879,285. Issued April 22, 1975. Official Gazette of the United States Patent Office, Vol 933, No 4, p 1741, April, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Aerobic conditions, Equipment, Aeration, *Aerobic treatment, Domestic wastes.
Identifiers: *Aerobic digestion.

An apparatus and method for the aerobic digestion of sewage have been patented. The apparatus consists of the following parts: an essentially cylindrical treatment tank; a sewage water inlet line; a water discharge line defining an outlet within the center portion of the treatment tank; an air space above the surface of the water; an air conduit; means for directing a flow of air against the surface of the water to be treated in a manner such that circulation of the sewage in a horizontal circular path is effected; an air discharge passage from the air space for removing the circulated air. The sewage is treated by introducing it into the tank, supplying the air to effect the circulation of the water thereby centrifugally moving the heavier more polluted water radially outward in the tank while diffusing air into the water, and then exhausting the air. (Orr-FIRL)
W75-11507

SEWAGE TREATMENT DEVICE,
International Telephone and Telegraph Corp., New York. (assignee).
A. J. Peirish, Jr., and T. M. Uyeda.
United States Patent 3,878,569. Issued April 22, 1975. Official Gazette of the United States Patent Office, Vol 933, No 4, p 1513, April, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Equipment, Municipal wastes, Domestic wastes.
Identifiers: Maceration.

A device for the treatment of sewage has been patented. It contains the following parts: a housing including a generally cylindrical section and a forward sewage inlet end; a rotable shaft coaxially mounted within the cylindrical section; a sewage macerating and conveying means mounted on the rotable shaft; an impeller mounted on the shaft; a discharge outlet on the housing; a means for rotating the shaft to cause maceration of the sewage entering through the inlet end and also to convey sewage to the impeller and out through the discharge outlet. The macerating means is comprised of a tapered auger-like element with a point facing forward, and a pair of blades with spiral-shaped leading edges converging toward the point. (Orr-FIRL)
W75-11508

DOMESTIC SEWAGE SYSTEM,
N. D. Arnot, Jr.
United States Patent 3,879,290. Issued April 22, 1975. Official Gazette of the United States Patent Office, Vol 933, No 4, p 1743, April, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, Equipment, *Sewage treatment, Domestic wastes, Sterilization, *Oxidation, Aeration.

A patented sewage system which is designed primarily for domestic use consists of the following parts: two tanks of a similar size; a third tank smaller than the first two; connections between the three tanks in flow series; inlet means for sewage to enter the first rank and then flow into the second and third tanks; means for continuously aerating the sewage in the first and second tanks; means for causing essentially complete oxidation of the contents of the third tank; and timer means for actuating the oxidizing means and discharge means according to a predetermined sequence. The time sequence is in response to the filling of the third tank, allowing sufficient time for the sterilization of the contents of the third tank. (Orr-FIRL)
W75-11509

SEWAGE TREATMENT SYSTEM,
V. J. Kovarik.
United States Patent 3,875,051. Issued April 1, 1975. Official Gazette of the United States Patent Office, Vol 933, No 1, p 337-338, April, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Equipment, *Biodegradation, Treatment, Suspended solids, Domestic wastes, Sewage, Flow control, *Separation techniques.

This patented method for collecting and treating sewage consists of the following steps: collection of the sewage of several containers; storage and non-biodegradable sewage solids in each container; partial decomposition of biodegradable solids through diagenetic decomposition in each container to reduce them in size and alter their specific gravity; separation (in each container) of the liquid sewage containing suspended solids smaller than a predetermined size from floating settled, and other solids; accumulation and temporary storage of these liquids and suspended solids between predetermined levels in each container; and, pumping the stored liquids and solids from each container as the liquid reaches the predetermined upper level. The storage of each container is used to promote a more even flow rate from a plurality of containers through collection lines interconnecting each container and the central final treatment means. (Orr-FIRL)
W75-11510

SEWAGE DISPOSAL SYSTEM,
Babcock and Wilcox Co., New York. (assignee).
E. P. Foster, R. J. Kelly, and W. L. Sage.
United States Patent 3,875, 357. Issued April 1, 1975. Official Gazette of the United States Patent Office, Vol 933, No 1, p 416, April, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Sewage disposal, Incineration, Fuel, Waste disposal, Ultimate disposal, *Sewage treatment, Municipal wastes.
Identifiers: A sewage disposal system has been patented which includes a liquid fuel fired steam generator, steam generating tubes, a furnace, and a passageway with a gas flow in communication

with the furnace. The first step is to fire the liquid fuel within the furnace to maintain a high temperature combustion zone for the generation of steam through indirect heat exchange. The fuel input to the furnace is continuously monitored. When the fuel input exceeds a predetermined level, a pressurized liquid-solids sewage mixture is injected into the combustion zone. The sewage input mixture is steam atomized prior to being injected, continuously metered into the combustion zone, and regulated so as to maintain a sewage to fuel input ratio resulting in essentially complete vaporization and incineration of the sewage mixture. (Orr-FIRL)
W75-11511

SEWAGE AND GARBAGE DISPOSAL.
Australian Patent 458,672. Issued March 6, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 7, p 682, March 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Waste disposal, Ultimate disposal, Incineration, Fuels, Oil, Oxidation, Domestic wastes, Oil wastes, *Sewage disposal.
Identifiers: Hydrocarbon fuels.

A process for the disposal of garbage, solid waste matter, sewage, or mixtures thereof has been patented. The ground garbage, ground solids waste matter and/or thickened and dewatered sewage is combined in a mixing zone with a fluidizing medium. The fluidizing medium can be a liquid hydrocarbon fuel, a liquid hydrocarbon fuel-particulate carbon slurry, a particulate carbon-water slurry, or a mixture of these. The resultant mixture is called the feed mixture and is introduced into the reaction zone of a free flow unpacked noncatalytic gas generator. The feed mixture is reacted by partial oxidation with a free-oxygen containing gas and stream under synthesis-gas producing conditions. The conditions comprise an autogenous temperature in the range of 1500 to 3000 F and a pressure in the range of one to 250 atmospheres. The result of the reaction is a hot gaseous effluent stream composed of hydrogen, carbon monoxide, carbon dioxide, water, and particulate carbon.
W75-11514

DESALINATION OF WATER.
For primary bibliographic entry see Field 3A.
W75-11515

TREATING SEWAGE.
Australian Patent 459,688. Issued April 10, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 11, p 1161, April, 1975.

Descriptors: *Patents, *Sewage treatment, *Filtration, *Waste water treatment, Suspended solids, Equipment.

Water containing suspended solids from a sanitary system may be treated by a patented method. The steps comprise: aerating the water; delivering the water to a screen with a directional component across the screen surface and a directional component through the screen. This screen has openings which are large enough to pass the majority of suspended solids, and the screen can hold a coating of the solids on its upstream side, controlling the flow of water containing suspended solids. As a coating of suspended solids forms of the screen surface, water is continuously delivered, and solids are filtered from the water passing through the coating and the screen. The relationship between the directional components is thus controlled, maintaining the coating on the screen, while still delivering water through the screen. Water which has passed through the screen is then stored and recycled to the sanitary system. (Prague-FIRL)
W75-11516

IRRADIATION PLANT FOR FLUID MATL - PARTIC SEWAGE SLUDGE.
Netherlands Patent 12845W/08. Issued March 7, 1975. Derwent Netherlands Patents Report, Vol W, No 12, p 3-4, April 29, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Sludge treatment, *Irradiation, *Treatment facilities.

Irradation of fluid material, particularly sewage sludge, is described. Radioactive sources are contained in an irradiation chamber, through which the material flows. The container for a series of radiation sources has channels for the introduction and withdrawal of these sources which can be closed off and sealed against the fluid material. A common closure piece is provided for closing these channels and can be pressed down onto the radiation source container by a clamping retaining element. The closure piece insures that radiation sources can be exchanged in a much shorter time. Thus the danger that one or more channels is not completely sealed is considerably reduced. (Prague-FIRL)
W75-11517

HORIZONTAL REACTOR FOR POLYMSN. SEWAGE OXIDATION ETC.,
F. Moser.
French Patent 87495V/51. Issued January 31, 1975. Derwent French Patents Report, Vol W, No 12, p 2, April 29, 1975.

Descriptors: *Patents, *Sewage treatment, *Water purification, Oxidation, Equipment, *Waste water treatment.
Identifiers: Hydrocarbons, Horizontal reactor.

A horizontal reactor is used for several chemical reactions including sewage water purification, sulfur dioxide absorption, and hydrocarbon halogenation. Reactions are carried out efficiently in a long horizontal vessel through which the main reaction medium, introduced at the inlet, flows. Over the whole length of the installation, separate devices are provided, positioned centrally at the bottom of the reactor. Holes are spaced closer at the start and widen in pitch progressively towards the opposite end. A second fluid medium is introduced at the point in order to set up additional currents rotating on axes parallel to the flow of the first medium. (Prague-FIRL)
W75-11518

DEVICE AND METHOD FOR CONDUCTING WASTE LIQUID FROM A RECEPTACLE TO A PNEUMATIC LIQUID DISPOSAL SYSTEM,
S. E. A. Svanteson.
Canadian Patent 967,843. Issued May 20, 1975. Patent Office Record, Vol 103, No 20, p 30, May, 1975.

Descriptors: *Patents, *Equipment, *Waste water treatment, Conduits, Liquids, Waste disposal, *Sewage disposal.
Identifiers: Vacuum disposal.

Equipment is described which conveys liquid from a holding receptacle to a vacuum sewage disposal system. There the waste liquid is conducted through a transport conduit. The conduit provides a suitable admixture of atmospheric air to the waste liquid being conveyed at the inlet end of the transport conduit. This gives greater efficiency in the conveyance of the liquid. (Prague-FIRL)
W75-11519

LIQUID TREATMENT APPARATUS HAVING COMBINED REACTION BASIN AND CLARIFIER,
L. S. Love.
Canadian Patent 968,081. Issued May 20, 1975. Patent Office Record, Vol 103, No 20, p 20-81, May, 1975.

Descriptors: *Patents, *Waste water treatment, Equipment, Aeration, Sludge, Industrial wastes, Municipal wastes.
Identifiers: *Clarification.

A treatment apparatus is designed for aerating or mixing, and clarifying liquids such as industrial and sanitary waste waters and for conducting chemical reactions. The aeration or mixing basin and the clarifier are formed as one integral unit separated by a baffle. The flow from the aeration basin into the clarifier is controlled by flow control plates. The bottom of the clarifier slopes toward the aeration basin bottom, such that solids settling in the clarifier flow down the clarifier bottom towards the aeration basin. This flow causes solids to be picked up by circulation in the aeration basin and re-suspended. A sludge scraper is periodically drawn across the clarifier bottom to dislodge sludge adhering to the bottom. The clarifier surface is periodically skimmed by a skimmer to remove scum. (Orr-FIRL)
W75-11521

SEWAGE DISPOSAL PROCESS,
A. Brent, and C. F. Teichmann.
Canadian Patent 967,751. Issued May 20, 1975. Patent Office Record, Vol 103, No 20, p 10-11, May 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage disposal, *Dewatering, Fuel, Oxidation, Sludge treatment, Water reuse.

A disposal method for sewage involves the conversion of the sewage into synthesis gas or fuel gas by dewatering municipal sanitary sewage and producing a thickened sludge. The thickened sludge is mixed with a fluid selected from a group composed of water, liquid hydrocarbon fuel, particulate carbon slurries in water or in a liquid hydrocarbon fuel which is produced subsequently in the process, and mixtures of these, to produce a feed mixture stream. The feed mixture is heated to a temperature between 212 and 600 F to vaporize volatile constituents in the feed mixture and to produce a feed dispersion stream. The feed dispersion stream is partially oxidized with an oxygen rich gas in an unpacked free-flow non-catalytic synthesis gas generator, at a temperature between 1500 and 3000 F and at a pressure between one and 250 atmospheres, to produce synthesis gas. The water separated from the sewage is purified and used for industrial purposes or converted into by-product steam by indirect heat exchange with the product gas. This method can also be used to dispose of garbage by mixing bits of garbage with the thickened sewage sludge and the fluid, forming a feed mixture which is converted into synthesis gas by partial oxidation reaction with an oxygen-rich gas in the same type of gas generator. (Orr-FIRL)
W75-11522

METAL REMOVAL BY PHYSICAL AND CHEMICAL TREATMENT PROCESSES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
T. Maruyama, S. A. Hannah, and J. M. Cohen.
Journal Water Pollution Control Federation, Vol 47, No 5, p 962-975, May, 1975. 13 fig, 11 tab, 47 ref.

Descriptors: *Heavy metals, *Coagulation, *Sedimentation, *Filtration, *Adsorption, *Separation techniques, Mercury, Zinc, Nickel, Copper, Manganese, Lead, Chromium, Barium, Arsenic, *Waste water treatment, *Trace elements.
Identifiers: Waste water pollution, *Physical-chemical processes, Carbon adsorption.

Physical-chemical processes consisting of coagulation, sedimentation, filtration, and carbon adsorption have been shown to be capable of remov-

ing substantial quantities of toxic or otherwise undesirable metals from raw wastewater. No one coagulation system gave the best removal for all metal forms. Metals tested were: Mn, Ni, Zn, Cu, Cd, Ba, Pb, Cr, As, Hg. The chemistry of the metals and the coagulant systems is presented. Although they are not evaluated in this study, suitable process modifications, such as a change of pH or the addition of oxidizing agents, reducing agents, and specific precipitants, should further enhance removal of the metals. The use of supplementary coagulants as filtration aids would also be expected to increase removal of precipitated metals. (Delfiner-Vanderbilt)
W75-11542

PLATING AND CYANIDE WASTES (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
J. E. Germain, and K. E. Patterson.
Water Pollution Control Federation Journal, Vol 46, No 6, p 1301-1315, June, 1974, 101 ref.

Descriptors: *Heavy metals, Analytic techniques, *Pollutant identification, *Reviews, Pollutants, *Ion exchange, Electrodialysis, Adsorption, Flotation, Carbon, Ozone, Iron, Reduction, Industrial wastes, *Waste water treatment, Bibliographies.
Identifiers: *Literature reviews, *Cyanide, *Plating wastes, Carbon adsorption, Kastone process, Scrap iron.

A review is presented of papers published in 1972-73 dealing with the technology developed to treat cyanide and plating wastes. Processes reported were conventional chemical treatment, ion exchange, evaporation, integrated chemical rinsing, precipitation of Cr (6+), electrolysis (after reduction to Cr (3+)), reverse osmosis, electro-dialysis, Kastone process, ozone destruction of cyanide, carbon adsorption, carbon bed catalytic destruction of cyanide, ion flotation, 'waste plus waste,' freezing processes, sulfide precipitation of metals, and reduction of chromium by scrap iron. (Delfiner-Vanderbilt)
W75-11545

OPEN CUT METHOD USED FOR MAJOR SEWER.
Engineering and Contract Record, Vol 88, No 6, p 14-15, June, 1975. 2 fig.

Descriptors: *Sewers, *Waste water treatment, Tunneling, Construction equipment, Earth handling equipment, Pipelines.
Identifiers: Sanitary collector sewer, Open cut construction method.

Open cut methods are being used by the Beaver Underground Structures of Ottawa, Canada, to install 2500 feet of a 5742 foot sanitary collector sewer. As compared to conventional tunneling, costs of the open cut method will be considerably lower. This method is possible with the use of large trenching equipment and sophisticated dewatering techniques. One of the first Koehring 1266D hydraulic excavators, with a maximum reach at grade level of over 60 feet and a maximum dig depth of 40 feet, was used for excavation; its five sized buckets have a capacity range from 5 1/2 to 12 5/8 cubic yards. Additionally, the project utilizes the Fiat-Allis HD41, the largest existing bulldozer, which can push up to 28 cubic yards of material at one pass. Pipelaying, pipe alignment by laser, and backfill are described. A deep well dewatering system was chosen, comprising 13 permanent wells. A pump system pumped 7 mgd at its peak. A 10-ft diameter tunnel has been excavated using two sunken shafts, one supported with steel sheet piping and ring beam whalers, the other with a 3-gauge liner plate. Whe completed in late 1975, the tunnel will be concrete lined to a 7 foot 6 inche diamter using full circle steel forms. (Kramer-FIRL)
W75-11618

MILE OF SEWER LINE RENEWED WITH PLASTIC PIPING.
Roads and Streets, Vol 118, No 6, p 94, 96, June, 1975. 3 fig.

Descriptors: *Waste water treatment, *Sewerage, *Plastic pipes, Construction materials, Pipes, Piping systems, Costs, Sewage treatment, Texas.
Identifiers: Remote tapping, Sewer repair.

Problems of backups, seepage, and an overloaded system due to breakdowns of existing pipes from unstable soil conditions in Houston, Texas have been solved. Rather than a conventional system of pipe removal and replacement, a one-mile sewer line was lined with ultra high molecular weight high density polyethylene pipe. This type of plastic piping is strong, very flexible, completely watertight, and chemically inert. Seven excavations were made over an 80 work day period and no more than one block of streets was closed to residents at any time. Segments of 8-inch diameter pipe 120, 350, and 453 feet long were inserted into the deteriorating line. A 16-inch diameter line was pulled 1016 feet, and a 20-inch diameter line was pulled 2350 feet. A remote tapping technique was used to connect house laterals to the sewer mains. This was the first municipal application of the tapping system. It involved: swaging down the flared plastic pipe (used for the connection) at the work site by forcing it into a die, making its diameter smaller; inserting the swaged pipe into a hole in the sewer main to the depth of the shoulder of the swage; and allowing the swaged part of the polyethylene pipe to return to its original size for a pressure tight seal. (Kramer-FIRL)
W75-11619

PIPE INSERTION RENEWS SEWERS WITH LITTLE EXCAVATION.
Water and Sewage Works, Vol 122, No 6, p 56-57, June, 1975. 2 fig.

Descriptors: *Waste water treatment, *Sewerage, *Sewage treatment, *Piping systems, Pipes, Plastic pipes, Costs, Construction materials, Pipelines, Sewers, Texas, Outfall sewers.
Identifiers: Sewer repair.

The collapse of a major clay outfall line which led directly to the Wylie, Texas sewage treatment plant occurred in 1972. The black-clay soil in that area is extremely corrosive; also, soil expansion during wet seasons exerts crushing pressures on the system's clay sewer pipes. The cost of direct burial of ductile iron pipe as replacement was the prohibitive amount of $175,000, and the city of Wylie chose instead to insert a flexible, corrosion resistant polyethylene pipe into 3730 feet of their deteriorated sewer lines. This new method saved the city close to 80 percent of the cost of the burial method. 'Aldyl' D polyethylene pipe, 13 3/8-inch diameter was heat-fused so that continuous lengths of up to 600 feet were formed. Ten lengths of plastic piping were each pulled by a 5/8 inch steel cable, threaded through the sewer from a winch located at a pulling excavation to an access trench at the opposite end of the line. Sewer insertion renewal was completed without disruption of service to the community, and excavation time was greatly reduced as compared to conventional pipe replacement. (Kramer-FIRL)
W75-11620

IMPROVEMENT OF COMBINED SEWER SYSTEM STORM WATER STORAGE POOL (GORYU-SHIKI GESUIDO NO KAIRYO, TAISUI IKE HOSHIKI),
S. Matsubara.
Gesuido Kyokaishi, Vol 12, No 131, p 39-46, April, 1975. 9 fig, 5 tab, 6 ref.

Descriptors: *Combined sewers, *Rainfall, *Storm water, *Waste water treatment, Sewerage, Model studies, Rivers, Overflow.
Identifiers: Storage pools, Japan.

Combined sewer systems, in which excess water from rainfall is forced to flow to a municipal river may be improved. This simulation considers a hypothetical storage pool to reduce the discharge of sewer water into a river under rainfall conditions. Two cases were discussed, each considering the amount of rainfall, capacity of the sewer systems, input rate ofthe sewage water by an urban population, BOD value in the sewer system, storage pool capacity, and capacity of the pump which is used to flush back the water in the storage pool to the sewer system when rainfall has stopped. A calculation was made for the Atsugi drainage system in which excess sewer water is flowed to a nearby river when the input rate of sewer water exceeds 3.0 cu m/sec. When a 30,000 cu m storage pool was employed with a pump of 2.3 cu m/sec capacity, the calculated number of overflows of the sewer sytem was 4.2/year which is 15% of the present number; overflow water into the river was 5.9 ton/year or 33% of the present level, and the overflow time was 102 hr/year or 16% of its present level. If the capacity of the storage pool was 10,000 cu m with the 2.3 cu m/sec pump, the overflow is calculated to occur 10.3 times/year with an overflow amount of 11.3 ton/year and overflow time of 29.8 hr/year. As long as the pump capacity is kept at over 0.5 cu m/sec, the determining factor of sewer water overflow to the river is the capacity of the storage pool. (Katayama-FIRL)
W75-11621

SUBSURFACE WASTE INJECTION IN THE UNITED STATES: FIFTEEN CASE HISTORIES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
E. C. Donaldson, R. D. Thomas, and K. N. Johnston.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.15. Information Circular 8636, 1974. 72 p, 27 fig, 19 tab, 54 ref.

Descriptors: *Industrial wastes, *Waste disposal wells, *Injection wells, *United States, Injection, Waste disposal, Geologic formations, Geology, Subsurface waters, Waste storage, Underground waste disposal, Waste water treatment, Liquid wastes, Slurries, Fluid mechanics, Design criteria, Costs, Water pollution.

Subsurface injection of liquid and slurry-type industrial waste is being used as a means of waste disposal. This U.S. Bureau of Mines survey showed that the method can be economically and environmentally attrative if the proper precautions are taken, especially when the alternative is cursory treatment and discharge at the surface. Attention was called to petroleum technology and experience that can be applied to subsurface waste injection. The report included discussions of: (1) the general aspects of subsurface waste-injection systems; (2) the literature concerning the geologic formations available for injection in the United States; and (3) 15 case histories describing the source and nature of the waste and the geology, surface equipment, well completion, and operation of the systems. (Robinson-ISWS)
W75-11627

PROVIDING SUBURBAN SEWERAGE DESPITE ENVIRONMENTAL AND CONSTRUCTION PROBLEMS,
Minnetonka Public Works, Minn.
D. Asmus, and J. Orr.
Public Works, Vol 106, No 7, p 76-77, July 1975. 3 fig.

Descriptors: *Sewerage, *Construction costs, *Construction equipment, Environmental effects, Dewatering, *Waste water treatment, Sewage treatment.
Identifiers: Sanitary sewers, Gravity sewers.

An internal trunk sanitary sewerage collection system was planned and constructed by the suburban community of Minnetonka, Minnesota. The system has been designed for a population equivalent of 160,000; projected costs were 15 million dollars with financing largely through the sale of general obligation improvement bonds. Construction was carried out by a series of thirty-one separate trunk sewer contracts. One environmental problem in construction was the building of an 18-inch gravity sewer out across Wing Lake in order to avoid damaging trees in the adjacent wooded land. To facilitate construction, over 17,000,000 gallons of water were pumped from the lake and it was afterward refilled from the municipal water system. Other problems included placing of sewers on treated wood piling in unstable soils such as the glacial moraine marsh areas, and the frequent drying up of private wells due to construction dewatering. The first problem was solved by longitudinal pile spacing of eight to twelve feet; the second was solved when residents with dried-up wells were supplied with a temporary water source and wells were found in most cases to be usable after dewatering operations were stopped. (Kramer-FIRL)
W75-11657

SEWAGE BIOLOGICAL PROCESSING,
S. Matskrle, and V. Matskrle.
Soviet Patent 415862. Issued May 20, 1975. Derwent Soviet Patents Report, Vol W, No 15, p 7, May 1975.

Descriptors: *Patents, *Biological treatment, *Sewage treatment, Flocculation, Separation techniques, Filtration, Activated sludge, *Waste water treatment, Coagulation, Flotation, Recycling, Water reuse.

A biological sewage treatment process was patented which operates by the formation of bioflocs, followed by filtration separation, flotation, and recirculation. The suspension is subjected to sedimentation, and the dilute suspension flows back, returning to the process. In this example, 5 to 7 kg/cu m of activated sludge was used with sewage in the activation chambers, with a residence time of two to three hours being sufficient for purification. The separation rate was up to one mm/sec; oxidation activity was 18.5 g 02 from one cu m of air. The chamber used was divided into two similar chambers to allow the flocs to float freely and to grow. Dilute suspension flowed directly to the filters for separation and the flocs floated to a homogenizer where coagulant could be added to the suspension. (Kramer-FIRL)
W75-11658

WASTE WATER AND SEWAGE PURIFICATION.
French Patent 22898W/14. Issued February 21, 1975. Derwent French Patents Report, Vol W, No 14, p 3, May 1975.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, Sludge treatment, Oxygen, Activated sludge, Tanks, Treatment facilities.

A plant patented for waste water and sewage purification is described. The facility uses pure oxygen or air enriched with oxygen in the presence of activated sludge. A biological tank contains bacterial beds which are in the form of discs one cm thick, spaced 2.5 cm apart. A quantity of 1.5 to 2.0 kg of sludge per cu m of the tank may be maintained on the discs; of this, one kg or more is living matter. The tank is connected by an overflow to a clarifier from which the purified water overflows while sludge collects at the bottom. Water to be treated as well as some of the sludge from the base of the clarifier arrive at the inlet together. Oxygen is introduced and the oxygenated water passes into the biological tank, meeting activated sludge. Aeration takes place outside the biological tank, with a low circulation rate and a reduction in the energy requirements. (Kramer-FIRL)
W75-11659

BIOLOGICAL AND CHEMICAL PURIFICATION PLANT.
Belgian Patent 22554W/14. Issued March 3, 1975. Derwent Belgian Patents Report, Vol W, No 14, p 3, May 1975.

Descriptors: *Patents, *Biological treatment, *Waste water treatment, *Water treatment, Costs, Equipment, *Treatment facilities.
Identifiers: Chemical treatment, Modular units.

A biological and chemical water purification plant for use in populated areas was issued a patent. The plant is constructed from uniform modular units which reduce manufacturing costs and allow for the assembly of different types of purification plants. Biological purification equipment consists of three recipients with cylindrical envelopes which are open at the top and have conical shoulders arranged tangentially. The space between two recipients, formed by an inclined wall, forms a separation space to separate the suspended floccules from the purified water. A partition forms a gas separation space in which the gas is removed from the purified water before its entry into the separation space. Aerators in the activation space are provided and are immersed to a shallow depth. Raw water enters at the center of this space and clarified water leaves via collecting pipes in the upper portion of the plant. Sludge is withdrawn through aeration grids which make the operation economical and lower the energy consumption. (Kramer-FIRL)
W75-11660

DOMESTIC WASTE WATER AND SEWAGE EVACUATION DEVICE.
French Patent 29528W/18. Issued March 21, 1975. Derwent French Patents Report, Vol W, No 18, p 5, June 1975.

Descriptors: *Waste water treatment, *Patents, Domestic wastes, Sewage treatment, Sewers, Pumps, Tanks, Domestic water, Costs, Equipment.
Identifiers: Evacuation.

An evacuation device for domestic waste water and sewage was patented, for use when the lowest point of an installation is below the level of the sewer or the septic tank. The equipment consists of a welded metal tank, which acts as a reservoir and a turbine pump driven by an electric motor with a vertical shaft. Waste water entering at the top of the tank is pumped out through a pipe; this water reaches the pump by an opening. Volute, surrounding the pump turbine, is kept filled so that the pump is continually primed and there are no starting problems. The tank and its connections all are welded and simply constructed; costs are therefore low and space requirements minimal. (Kramer-FIRL)
W75-11661

SOLIDIFICATION OF SEWAGE SLUDGE TO A HARD MATERIAL.
Belgian Patent 29090W/18. Issued April 1, 1975. Derwent Belgian Patents Report, Vol W, No 18, p 2, June 1975.

Descriptors: *Patents, *Sewage treatment, Drying, *Sewage sludge, Coagulation, *Waste water treatment.
Identifiers: Aluminosilicates, Sludge solidifying, Waste reuse.

A patent was granted for a method of solidifying sewage sludge into a hardened solid material. This may be accomplished with or without prior coagulation and decantation by incorporation of aluminosilicates on a dry weight basis. For example, fly ash (preferably 30 to 80%), lime (preferably 1 to 6%), earth (preferably 20-45%), and CaSO4, usually as anhydrite (preferably 1.5 to 3.0%) are utilized. The final water content is optimally 15 to 30% and the final dry weight of solid sludge varies from one to 50%, preferably 4 to 20%. The fly ash may be replaced by crushed furnace slag; CaSO4 may be replaced by an equimolar amount of alkaline earth metal sulphate; and cement dust, quicklime or dust from a basic oxygen furnace may substitute for the lime. Hardening in the atmosphere gives a granular or monolithic solid, which can be used as a building material. The product offers good resistance to compression, humidity, and leaching. (Kramer-FIRL)
W75-11662

WASTE WATER PURIFICATION.
South African Patent 30562W/18. Issued February 5, 1975. Derwent South African Patents Report, Vol W, No 18, p 3, June 1975.

Descriptors: *Patents, *Waste water treatment, *Sludge treatment, Oxidation, Potable water, Separation techniques, Water reuse, Coagulation, Acidity, *Water reuse.
Identifiers: *Wet air oxidation, Aluminum compounds, Waste reuse.

A patent was granted whereby waste water is purified and the oxidized sludge may be reused for further waste treatment. This potable water clarification or waste water purification process consists of coagulation-separation, using coagulants of aluminum compounds. Wet air oxidation treatment of the sludge results from the coagulation-separation process. The pH of the sludge should be adjusted in advance so that an oxidized sludge of pH below 1.5 or above 9.0 can be obtained. The oxidized sludge may be reused for water treatment either directly or after the dissolving of the aluminum compounds by the addition of acid or alkali. (Kramer-FIRL)
W75-11663

ADVANCED TREATMENT OF WASTE WATER AFTER SECOND STAGE TREATMENT. EXPERIMENTAL RESULTS AT THE WATER TREATMENT PLANT OF KAWASAKI CITY (GESUI NIJI SHORISUI NO KODO SHORI, KAWASAKI-SHI GESUI SHORIJO NI OKERU JIKKEN HOKOKU).
Mizushori Gijutsu (Water Purification and Liquid Waste Treatment), Vol 16, No 4, p 365, 1975. 23 fig, 17 tab.

Descriptors: *Waste water treatment, *Water purification, *Tertiary treatment, *Water reuse, Coagulation, Filtration, Activated carbon, Adsorption, Electrodialysis, Reverse osmosis, Water treatment, Treatment facilities.

The advanced purification of secondary treated waste water for reuse as industrial water was studied. Waste water treated by a conventional sewage plant is used as the raw water, and it is treated by coagulation with inorganic and organic reagents, followed by filtration, activated carbon adsorption, and electrodialysis or reverse osmosis. The raw water with 10 ppm turbidity may be improved to 2 ppm turbidity with the addition of 60 ppm inorganic and one ppm organic coagulating agents. The 75% to 95% of COD, TOC, and ABS were removed by an activated carbon, but adsorption of ammonia, heavy metals, and phosphates were difficult by the activated carbon. More than 90% removal of sodium, potassium, chloride, sulfate ions was achieved with 150 minute deionization by an electrodialysis technique, and water with the dielectric constant less than 100 microohm/cm could be obtained. However, insoluble salts and organic compounds were not removed by this method. The osmosis technique was also applicable to the purification of raw water, and purified water of industrial quality can be continuously produced for several hundred hours. (Katayama-FIRL)
W75-11664

COAGULANT RECOVERY TAKES PLANNING,
C. G. Dunkle.
Water and Wastes Engineering, Vol 12, No 5, p 47-48, 104, May 1975.

Descriptors: *Waste water treatment, *Sludge treatment, Lime, Recycling, *Coagulation, Economics, Costs, Dewatering, Waste disposal, Polymers, Polyelectrolytes.
Identifiers: *Coagulants, *Alum, Recovery, Magnesium carbonate.

The recovery of coagulants from the waste sludge of water treatment plants demands the prior study of each specific coagulant and related methods of clarification. Several treatment facilities are discussed. For example, the recovery of alum at Tampa, Florida for reuse in the filtration plant gave odorless waste solids which could be stored before final disposal. Similarly, reclamation of lime and CO2 from chemical treatment plants at Dayton, Ohio, and St. Paul, Minnesota, lessened the final disposal problem and reduced the facilities' operational costs. In Montgomery, Alabama, lime and MgCO3 were recovered; the magnesium carbonate is recycled to remove color and turbidity from raw water. Applicability of polymers as primary coagulants, coagulant aids, and sludge conditioning agents are being investigated. Polymers are expensive but more efficient than alum. However, there is no universal polymer, and careful choice of specific polyelectrolyte is necessary for individual applications. The efficiency and economy of sludge production and handling indicated that a combination of alum recovery and horizontal vacuum filtration would require a large capital and operating costs but would produce a useful end product, decrease the size of dewatering equipment needed, and reduce landfill requirements. (Kramer-FIRL)
W75-11665

THE APPLICATION OF MEMBRANE PROCESSES IN THE TREATMENT OF SEWAGE,
Atomic Energy Research Establishment, Harwell (England).
D. C. Sammon, and B. Stringer.
Process Biochemistry, Vol 10, No 2, p 4-12, March 1975. 2 fig, 11 tab, 56 ref.

Descriptors: *Membrane processes, *Reverse osmosis, *Waste water treatment, Water quality, Activated sludge, Costs, *Sewage treatment.
Identifiers: Ultrafiltration, Electrodialysis, Effluent reuse, Salt removal.

The membrane processes of reverse osmosis, ultrafiltration, and electrodialysis, now established for water treatment, are under evaluation for use in sewage effluent treatment. With an increasing reuse of sewage effluents, possible applications of membrane processes are in the reduction of salt content and of several organic species. Findings of published experimental work were reviewed. The major areas of investigation were: stability of flux and the mechanism of flux loss due to fouling; product quality with respect to a range of species; treatment of sludges; and economics and possible applications. It was concluded that direct reuse of sewage effluent for potable water has not yet received public acceptance. Costs of reverse osmosis rather than conventional treatment for water reuse at a less than potable quality level indicate that osmosis is not economically feasible. The state of the art currently is that pilot scale work has identified problem areas and indicated operational techniques. Except for the use of activated sludge treatment, coupled with ultrafiltration, membrane process applications for waste water treatment remain theoretical. (Kramer-FIRL)
W75-11666

SEWAGE TREATMENT PLANT EQUIPPED WITH AN AERATION IMPELLER,
J. R. Kaelin.
Canadian Patent 968,475. Issued May 27, 1975. Patent Office Record, Vol 103, No 21, p 81, May 1975.

Descriptors: *Patents, *Waste water treatment, Treatment facilities, *Sewage treatment, Equipment, *Aeration, Design.
Identifiers: *Aerators.

A patent has been issued for a sewage treatment plant which is equipped with a motor driven aerator. The aerator is supported in a basin at a minimum of three points. The support mechanism for the aerator embodies at least two supports which at their ends nearest to the aerator enclose an acute angle with a horizontal plane less than 45 degrees. (Orr-FIRL)
W75-11670

REPORT OF ANALYSES FOR INDUSTRIAL WASTE WATER IN TWENTY-EIGHT FACTORIES, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5A.
W75-11671

MEANS FOR AND METHOD OF PURIFYING CONTAMINATED WATER,
R. J. Campbell.
United States Patent 3,885,399. Issued May 27, 1975. Official Gazette of the United States Patent Office, Vol 934, No 4, p 1379, May, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Water treatment, Equipment, Freezing, *Crystallization.
Identifiers: *Freeze-crystallization.

A method for purifying contaminated water by freeze-crystallization has been patented. The apparatus consists of: a first stage including a first freezer-crystallizer and wash collumn subassembly for treating contaminated water and producing a first concentrate; a second freezer-crystallizer and wash column subassembly for treating the first concentrate and producing pure ice crystals and a second concentrate; and, means for returning part of a mixture of ice crystals and first concentrate from the second wash column to the first stage. The second freezer-crystallizer is coupled to the first wash column to receive the first concentrate and also to the second wash column to receive the second concentrate. The second wash column is coupled to the first wash column for receiving and using the first concentrate to wash the ice crystals in the second wash column and to form a mixture of the first concentrate and the ice crystals. (Orr-FIRL)
W75-11672

PURIFYING PLANT FOR SEWAGE,
J. Bosje.
Canadian Patent 967,295. Issued May 6, 1975. Patent Office Record, Vol 103, No 18, p 75, May, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Activated sludge, Biological treatment, Aeration, Sludge treatment, Treatment facilities.

An activated sludge process sewage treatment plant has been patented. The plant includes an open curved tank with an elongated aerating space shaped so that its end walls are located adjacent to each other. The aerating space is divided by a partition wall which forms an inner channel portion enclosed within an outer channel portion. The channels are in series with each other, forming an endless aerating channel. Means are provided to discharge sewage into the aerating channel and to withdraw aerated sewage from the channel. A minimum of one surface aerator is provided for aerating the contents of the aerating channel. At least one sludge thickening chamber is concentrically arranged in the sludge settling chamber which is located in the inner channel portion of the aerating channel. Means are provided for returning settled sludge from the settling chamber to the aerating space, and for discharging the purified water out of the sludge settling chamber. The end walls of the aerating channel are separated to provide space for the apparatus for operating the plant and for a control chamber. (Orr-FIRL)
W75-11673

SANITARY-VIROLOGICAL STUDY OF THE EFFECTIVENESS OF DECONTAMINATION OF WASTE WATERS ON IRRIGATED FARM YIELDS, (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
For primary bibliographic entry see Field 5B.
W75-11674

SEWER BRANCH SADDLE CONNECTOR,
For primary bibliographic entry see Field 8C.
W75-11677

DISTRIBUTION OF LIGNIN IN THE WATERS OF LOURIZAN INLET, AS A MEASUREMENT OF CONTAMINATION DUE TO DUMPING OF LIGNINSULFONIC LYES, RESULTING FROM PRODUCTION OF CELLULOSE PULP, (IN SPANISH),
Instituto Espanol de Oceanografia, Madrid (Spain).
For primary bibliographic entry see Field 5B.
W75-11678

CENTRIFUGAL PUMP FOR PROCESSING LIQUIDS CONTAINING ABRASIVE CONSTITUTENTS, MORE PARTICULARLY, A SAND PUMP OF A WASTEWATER PUMPER,
Neratoom N.V., The Hague (Netherlands). (assignee).
J. H. Bunjes.
United States Patent 3,881,840. Issued May 6, 1975. Official Gazette of the United States Patent Office, Vol 934, No 1, p 227-228, May, 1975. 1 fig.

Descriptors: *Patents, *Pumps, *Centrifugation, *Waste water treatment, Equipment.

A centrifugal pump for waste water treatment was patented, consisting of: a housing with an inlet opening and an annular delivery chamber; an impeller whose inlet eye is aligned to the inlet opening and whose peripheral portion discharges to the delivery chamber. The impeller and the housing thus define an intermediate chamber leading to the delivery chamber. Also, sealing means are formed between the openings, including opposed surface portions of the impeller. These define a sealing slot which has an outer end communicating with the intermediate chamber and an inner end connected to the inlet opening. Duct means in the impeller lead from an annular chamber to the intermediate chamber in order to redirect sediment back into the intermediate chamber. (Kramer-FIRL)
W75-11679

AIR DRIVEN ROTATING BIOLOGICAL CONTACTOR APPARATUS,
Autotrol Corp., Milwaukee, Wis. (assignee).
D. G. Prosser.
United States Patent 3,886,074. Issued May 27, 1975. Official Gazette of the United States Patent Office, Vol 934, No 4, p 1594-1595, May, 1975. 1 fig.

Descriptors: *Waste water treatment, *Patents, *Biological treatment, *Aeration, Equipment, Oxygen.
Identifiers: Biological contactor apparatus.

The equipment for biological treatment of waste water by an air driven rotating biological contactor was patented. The apparatus consists of a treatment tank with both a fluid inlet and a fluid outlet, a circular rotating biological contactor assembly which is mounted for rotation around a horizontal axis and which can be partially submerged in the waste water in its tank. Several pockets are built along the length of the contactor and have a depth of the minor portion of the radius of the contactor assembly. A source of oxygen which contains gas under pressure and a gas conduit leading from this source into the tank are described. The conduit has submerged openings beneath the length of the contactor. Each pocket opens outwardly in a direction opposite to the direction of rotation of the assembly in order to trap gas released from the conduit. (Kramer-FIRL)
W75-11680

OXYGENATION OF WASTE WATER,
P. W. Garbo.
Canadian Patent 970,483. Issued July 1, 1975. Patent Office Record, Vol 103, No 26, p 82-83, July, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Oxygenation, Suspended solids.

Sewage or other waste water may be oxygenated using a patented process. The waste water is passed through a turbulent mass of solid contact particles, together with oxygen-containing gas. Pollutant solids collide with these contract particles which may be made of coarse sand, and a fine dispersion of the oxygenating gas results throughout the liquid suspension. The contact of the dispersion of gas with the suspended and dissolved solids of the sewage or waste water causes an acceleration in the oxygenation process. (Kramer-FIRL)
W75-11681

BIOLOGICAL PURIFICATION OF WASTE WATER.
Australian Patent 461,079. Issued May 15, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 16, p 1791, May, 1975.

Descriptors: *Patents, *Biological treatment, *Waste water treatment, *Activated sludge, Aeration, Settling basins.
Identifiers: Clarification.

A patent was issued for a method of biological waste water treatment. Activated sludge treatment is used in equipment consisting of common enclosure aeration and settling-clarification sections. The system is designed so that the two sections communicate with each other and aerated liquid may flow from the aeration section to the aeration section. Aerated liquid is directed to the bottom of a set of parallel inclined plates which cover almost the entire settling surface area of the settling-clarification section. (Kramer-FIRL)
W75-11683

SEWER LINE BLOW-OUT PLUG,
M.M.S., Inc., Memphis, Tenn. (assignee).
For primary bibliographic entry see Field 8C.
W75-11684

SEWAGE TREATMENT PROCESS,
G. V. Levin, and G. J. Topol.
Canadian Patent 970,887. Issued July 8, 1975. Patent Office Record, Vol 103, No 27, p 84, July, 1975.

Descriptors: *Patents, *Activated sludge, *Waste water treatment, *Sewage treatment, Nutrient removal, Biological treatment, Phosphates, Sludge treatment, Anaerobic conditions.

An activated sludge treatment process was patented, consisting of mixing influent sewage material with activated sludge to provide a mixed liquor. This mixed liquor is passed first to an aeration zone, where BOD is reduced and microorganisms present take up phosphate, and then to a settling zone, containing an anaerobic sludge layer. In the settling zone, the phosphate-enriched sludge settles into the anaerobic sludge layer, so that a substantially phosphate-free effluent is removed from above the sludge layer. Sludge must be maintained under the anaerobic conditions long enough for the organisms in the sludge to release phosphate to the liquid phase of the sludge. Sludge is then treated to remove the soluble phosphate from its liquid phase and is then recycled for mixing with influent sewage material. (Kramer-FIRL)
W75-11685

OUTLINE OF TAGAWA SEWAGE PLANT IN UTSUNOMIYA CITY, (IN JAPANESE),
I. Koike, and N. Saito.
Gesuido Kyokaishi, (Jour of Japan Sewage Works Assoc), Vol 12, No 129, p 72-76, February, 1975. 1 fig, 3 tab.

Descriptors: *Waste water treatment, *Sewage treatment, Facilities, Municipal wastes, Sludge treatment, Precipitation(Chemical), Aeration, Chlorine, Dehydration, Incineration, *Treatment facilities.
Identifiers: *Japan.

Since 1965, the Tagawa plant in Utsunomiya city Japan, has been treating its municipal sewage water. With an added capacity of its facility in 1970, the plant now treats waste water for a population of 125,000. The sewage water is passed through several screens to remove large objects before entering a sand-precipitation pool. It is then pumped into a first-precipitation pool and stays for 1 3/4 hours in the pool. The supernatant water then enters into an aeration tank, a final-precipitation pool, and a chloride mixing pool, before being discharged into the Tagawa River. During wet weather, the aeration and final-precipitation steps are skipped, and the supernatant water is sent directly to the chloride mixing pool. Sludges produced during precipitation and aeration treatment are sent to a sludge concentration tank. After dehydration of the treated sludges, they are sent to an incinceration furnace and combusted at 800 to 1000C. (Katayama-FIRL)
W75-11686

PACKAGE PLANT OWNER RESPONSIBILITY AND OPERATION OF SMALL SEWAGE UNITS,
N. P. Nicolle.
Water Pollution Control, Vol 74, No 2, p 199-200, 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Maintenance, Aeration, Biological treatment, Filters, Sewage effluents, *Operations, *Treatment facilities.
Identifiers: *Package plant sewage units, Effluent control.

The necessary care and maintenance of package plant small sewage units is described. The major required daily duty is removal of gross solids to prevent sewage from backing up or overflowing, particularly in the openings of valves and pumps. Package plants of the conventional biological filtration type and extended-aeration units with aerobic digestion are the two basic types of package plants available for small communities. Quality control for the conventional unit requires the daily determination of settleable solids in primary sedimentation tank effluent as well as from humus tanks or sand filters and determination of residual chlorine which may be present in effluent entering the contact tank. On a monthly or three-monthly basis, values should be measured of: 4-hour permanganate value; COD, ammonia nitrogen, suspended solids, fecal E. coli, and methylene blue stability. For the extended aeration units, daily determination must be made of settleable solids in effluent, MLSS concentration by centrifuge, and residual chlorine in the final effluent. The final effluent should be checked monthly for SS, 4-hour permanganate value, COD, ammonia nitrogen, fecal E. coli, and methylene blue stability. For both types of packages, cleaning is necessary of filters, screens, pipes, drying beds, tanks, and other surfaces. Other specific maintenance recommendations are given, in order to keep the unit at peak performance. (Prague-FIRL)
W75-11688

PACKAGE PLANTS: THE CONTRACTOR'S POINT OF VIEW,
E. L. Choritz.
Water Pollution Control, Vol 74, No 2, p 201-203, 1975.

Descriptors: *Sewage treatment, *Administration, Waste water treatment, Equipment, Design, Effluents, Population, *Waste treatment.
Identifiers: *Sewage treatment package plants.

Package type sewage plants are discussed from the point of view of the contractor. Advantages to the contractor of such plants are that a discrete range of standard products can be offered, eliminating design, administrative, and after sales costs; overall plant responsibility minimizes possible controversy over process malfunction or failure; and plant complexity is reduced, plant compactness increased, and costs decreased without affecting plant performance. The disadvantages of package plants for the contractor include: a lack of flexibility in choice of size range; absence of adaptability; and difficulty for a prospective client to assess and judge the variety of types of packages offered by different contractors. When a client approaches a contractor directly, he specifies a contributing population or a total daily flow; he also may specify the particular type of treatment to be employed. However, the plant design, size of equipment, and guarantee of performance and quality is up to the contractor. Package plants should not be specified where extreme variations in population (such as a temporary camping site) occur. It is expected that package sewage treatment plants will increase in use. Control and regulation of effluent discharges necessitates enlarging their field of application. Non-biological treatment processes in package plants are needed as are plants which will operate at peak efficiency regardless of the volume and load of the influent. (Prague-FIRL)
W75-11689

THERMOPHILIC DIGESTION AT THE HYPERION TREATMENT PLANT,
Los Angeles Sanitation Bureau, Playa del Rey, Calif. Hyperion Treatment Plant.
W. F. Garber, G. T. Ohara, J. E. Colbaugh, and S. K. Raksit.
Journal Water Pollution Control Federation, Vol 47, No 5, p 951-961, May, 1975. 6 fig, 5 tab, 10 ref.

Descriptors: *Waste water treatment, *Sludge treatment, *Anaerobic digestion, *Temperature, Heat, Energy, Costs, Organic loading, Dewatering, California.
Identifiers: *Thermophilic digestion.

The Hyperion Treatment Plant, Playa del Rey, California, used full-scale thermophilic digestion (thermophilic temperatures, 46-54.5C) from 1953 to 1957. Thermophilic digestion is again being instituted at the plant in an attempt to achieve total removal of digested-screened solids prior to ocean disposal of the treated waste water. In addition to confirming earlier conclusions about thermophilic anaerobic digestion, the dewaterability of thermophilic sludge through the use of various types of chemical conditioning and dewatering apparatus is being examined. Thermophilic anaerobic digestion

of waste water solids has been shown to be a successful process. Temperature change has been found to be more critical than with mesophilic digestion. The solids dewatering step is significantly improved by the thermophilic digestion. The solids particle sizes are larger, lower amounts of chemicals are needed, drier cakes are obtained, and centrate-filtrates carry substantially fewer solids. The work at the Hyperion plant is still incomplete; the upper limits of loading are not yet established. At the currently possible temperature and loadings, the changes in gas production and solids breakdown do not overcome the added environmental and monetary costs of the extra heat energy needed if the change in sludge dewatering is ignored. The net benefit of thermophilic digestion seems to be greater than the costs resulting from the increased heat requirement. (Orr-FIRL)
W75-11690

PHASE II GIVES HAMILTON SECONDARY TREATMENT.
Water and Pollution Control, Vol 113, No 6, p 14-16, June, 1975. 5 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Municipal wastes, *Biological treatment, Activated sludge, Incineration, Methane, Fuels, Industrial wastes, Nutrient removal, Canada, *Sewage treatment.
Identifiers: Hamilton(Ontario Canada).

A secondary treatment phase was recently added to the municipal sewage treatment plant at the City of Hamilton, Ontario, Canada. The secondary treatment phase includes activated sludge treatment, pressure flotation for excess activated sludge thickening, additional digester, filter and boiler capacity, sludge incineration, stand-by power facilities, and landscaping. It also includes a 5000 IGPD pilot treatment plant which is being used to study the effects of biological treatment of various industrial wastes discharged to the sewer system, and for assessing the effectiveness of different nutrient removal processes. The methane gas generated in the digestion process is used as alternative fuel for the diesel generators during peak periods. The gas is also used as fuel for the sludge incinerators, to fire the steam boilers for heating the buildings, and for the digestion process. The plant has been essentially trouble free in operation and produces a high quality effluent. A quantitative description of some of the equipment is given as well as an outline of the treatment process. (Orr-FIRL)
W75-11692

SWEDISH EXPERIENCES IN CHEMICAL TREATMENT OF WASTEWATER,
Scandiaconsult International A.B., Stockholm (Sweden).
L. Ulmgren.
Journal Water pollution Control Federation, Vol 47, No 4, p 696-703, April, 1975. 4 fig, 5 tab, 9 ref.

Descriptors: *Chemical precipitation, *Waste water treatment, *Phosphorous, *Nutrient removal, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Hydraulic design.
Identifiers: Sweden, Lamella sedimentation.

Sweden has more than 500 plants that are designed for the chemical treatment of sewage with or without biological treatment and more than 600 plants that use biological treatment alone. Chemical treatment is gaining in favor because of the restrictions of phosphorus content and BOD of the discharged effluent and also because the long winters in the northern part of Sweden make biological treatment unsatisfactory. The methods used for chemical treatment are direct (primary and secondary), simultaneous, and pre- and post-precipitation. Post-precipitation is used in 80-85% of the chemical treatment plants. Alum is used in 85-90% of the plants. Lime and bivalent or trivalent iron salts are also used. 'Guidelines for Design of Sewage Treatment Plants' has been prepared by the Swedish National Environment Protection Board. Sections for coarse treatment and primary sedimentation should be designed to handle more than four times the hydraulic flow. Biological and chemical treatment processes should be able to handle up to two times the hydraulic flow. Lamella sedimentation has been successfully used for the separation of chemical flocs, but does not work well for separating biological flocs. The results of a survey of more than 50 municipal treatment plants for chemical precipitation conducted from 1971 to July 1973, indicate that the majority of the plants operate relatively well. The use of chemical precipitation for treating many different types of waste water in Sweden is expanding because of the fact that chemical precipitation will reduce the BOD, COD, and suspended solids of the discharged water in addition to removing phosphorus. (Orr-FIRL)
W75-11694

UP-RATING HYDRAULICALLY OVER-LOADED SEDIMENTATION TANKS BY INCLINED PLATES,
T. W. Gray, and P. S. Churchill.
Effluent and Water Treatment Journal, Vol 15, No 2, p 77-81, February, 1975. 2 fig, 4 tab, 9 ref.

Descriptors: *Sedimentation, *Waste water treatment, Treatment facilities, *Settling basins, Sedimentation rates, Suspended solids.
Identifiers: *Sedimentation tanks.

High-rate sedimentation, by means of submerged inclined compartments, is becoming an established way to improve an existing overloaded municipal sewage treatment plant without expanding the facilities. CJB Developments is ofering two high-rate sedimentation processes using inclined corrugated plates to assist in this upgrading. The first process is the uprating of existing sedimentation tanks using low-cost high-rate sedimentation modules of plastic construction. The second process is a purpose-built, fabricated, high-rate sedimentation tank. The second process requires less land than a conventional tank and lowers the risk of developing anaerobic conditions. Conventional sedimentation tanks can be either horizontal-flow or upward-flow type. Both types can be successfully uprated for solids settlement using high-rate sedimentation modules. There is very little surface attraction to the plates in the CJBD module of the type of solids found in primary or humus tanks. The supernatant liquid flows in a clear stream up the arch-forming corrugation on the corrugated plate while the solids form a counter-current flow down the troughs. Washing down has not been necessary on a pilot unit which has been in operation for two years in a humus tank. (Orr-FIRL)
W75-11695

INNOVATIVE WATER PLANT SLATED FOR NEW JERSEY,
Havens and Emerson Ltd., East Paterson, N.J.
For primary bibliographic entry see Field 5F.
W75-11696

ENERGY-WASTEWATER TREATMENT AND SOLIDS DISPOSAL,
Playa Del Rey, Calif. Hyperion Treatment Plant.
W. F. Garber, G. T. Ohara, and S. K. Raksit.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE3, p 319-332, June, 1975. 5 fig, 4 tab, 21 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Environmental effects, *Energy, Biological treatment, Sludge disposal, Landfills, Bodies of water, Dewatering, Nitrification, Oceans, California, *Waste disposal.
Identifiers: Los Angeles(Calif), Santa Monica Basin(Calif), Chemico-physical treatment, Anoxic-anaerobic deep water.

Effluent discharge standards and funding criteria established by control agencies as a result of the concern about environmental quality have affected the design and construction of waste water treatment facilities and waste water solids disposal systems. The increased energy needed for advanced treatment methods may actually increase the overall pollution. Work at the Environmental Protection Agency's Cincinnati Laboratories has shown that an activated sludge process for complete nitrification uses almost twice as much energy as treatment for carbonaceous oxygen demand removal alone. The amount of fossil fuel combustion to produce this energy would undoubtedly cause an increase in negative environmental impact. The State of California Water Resources Control Board has notified the City of Los Angeles that it must cease discharging digested-screened waste water solids into the anoxic-anaerobic deep waters and sediments of the Santa Monica Basin by the end of 1976. The City of Los Angeles has operated both chemico-physical and biological waste water treatment facilities. They have found that the chemico-physical treatment requires almost five the amount of energy as biological treatment. Alternatives to disposal in the ocean are: pumping to evaporation ponds with disposal on sanitary landfills requiring 16 times the energy than ocean disposal; and, mechanical dewatering prior to sanitary landfill disposal requiring 35 times more energy than the prior to sanitary landfill disposal requiring 35 times more energy than the present method. (Dean-FIRL)
W75-11697

IN-LINE FILTRATION MAY BE JUST FOR YOU,
Nalco Chemical Co., Chicago, Ill.
G. J. Venema.
Water and Wastes Engineering, Vol 12, No 5, p 50-52, 57, May, 1975. 1 fig.

Descriptors: *Filtration, *Waste water treatment, Water quality, Filters, Coagulation, Polymers, Mass transfer, Solid wastes.
Identifiers: Filter media, Solids, Polycationics, Physico-chemical treatment.

In the past, filtration technology was concerned with rapid sand and high rate filters. Current research in filtration technology is directed at the definition of the parameters for deep-bed filtration, upflow filtration, direct filtration, and in-line filtration. In-line filtration is an alternative to coagulation/settling for treating low turbidity water. Treatment requirements for water quality goals are the primary concern of direct and in-line filtration. Increasing the allowable flow rate through a media is the concern of rapid sand, deep-bed, and upflow filtration. Therefore, direct and in-line filtration treatment methods can be applied to rapid sand, high rate, deep-bed, and upflow filters. In direct filtration, coagulation of solids occurs prior to filtration. Coagulation occurs during filtration in the in-line filtration method. In-line and direct filtration depend on the theories of mass-transfer of solids from the liquid to the media surfaces and physico-chemical attachment of solids to the media. The advantages of these methods are a reduction of chemical consumption, a lower sludge production, longer filter runs, and improved water quality. The performance of in-line and direct filtration depend on the type and amount of solids, filter media characteristics such as effective grain size, depth and type, filter operating parameters including degree of flow surges and filtration rate, and achievement of optimum coagulation. Both direct and in-line filtration make use of polymers for coagulation, particularly polycationics, which are polyamines having low to moderate molecular weight and high cationic change density. (Dean-FIRL)
W75-11698

ADVANCED WASTEWATER TREATMENT PLANT WITH DESIGNED-IN RELIABILITY,
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
L. K. Anderson.
Public Works, Vol 106, No 6, p 81-84, June, 1975. 2 fig.

Descriptors: *Planning, *Treatment facilities, *Waste water treatment, *Tertiary treatment, Construction, Financing, Rivers, Water pollution, Reservoir storage, Activated sludge, Filtration, Chlorination, Effluents, *Oregon.
Identifiers: Washington County(Oreg), Tualatin River, Chemical treatment.

In the mid-1950's the rapidly growing suburban area of Washington County, Oregon, faced sewage collection and treatment problems due to lack of a master plan; by the mid-1960's the urban creeks had become open sewers. A waste water management plan was drawn, which called for the formulation of an area-wide agency responsible for financing, constructing, and operating the proposed regional facilities. The United Sewerage Agency of Washington County was established. The master plan called for the elimination of all treatment plants in the tributaries of the Tualatin, the major river, and the construction or expansion of six major plants on the river itself. The first and largest of the new facilites is the Durham Advanced Wastewater Treatment Plant, which will have a 20 mgd capacity upon completion. It can be expanded to 60 mgd. Reliability is a critical factor in this plant, as it is located in a residential area, and because of the need to minimize pollutant discharges to the Tualatin River, especially in the low river flow season (May to November). Flow augmentation is part of the total design, for which purpose multipurpose storage reservoirs were constructed upstream. During the rest of the year less stringent discharge standards are in effect; a conventional activated sludge plant, which has automatic surge and bypass control, meets these requirements. Advanced treatment features of the plant include chemical treatment and filtration prior to chlorination and discharge of the effluent from the activated sludge process, and preparation of organic sludge for incineration. (Murphy-FIRL)
W75-11700

A PLANT GROWS IN BROOKLYN,
Hazen and Sawyer, New York.
C. R. Walter, and J. Lastihenos.
Water and Wastes Engineering, Vol 12, No 6, p 36-42, June, 1975. 7 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Interceptor sewers, Screens, Pumps, Settling basins, Aeration, Sludge treatment, Sludge disposal, Chlorination, New York.
Identifiers: Skimmers, High-rate digesters, *New York(NY).

The expansion and modernization of New York City's 26th Ward Water Pollution Control Plant was completed in May 1975 at a cost of $43 million. The existing regulators on the interceptor sewers were modernized to handle storm overflow automatically. The original screens were replaced by new units about 40 feet long, with a conveying mechanism carrying the screenings to dry, above-grade screen chambers. Grit removal is performed in cyclone degritters on a sludge/grit mixture taken from the preliminary settling tanks. Main sewage pumps were replaced with units incorporating variable speed controls. Automatic skimmers and new safety and sludge handling units were added to the preliminary settling tanks. The aeration process was upgraded by the installation of modern air diffusers and high-efficiency electrostatic air filters, the establishment of new step-aeration feed points, and the repair of joints in the aeration tanks. The eight original folded-flow final settling tanks were combined into four straight-flow tanks and equipped with modern sludge collection and scum removal equipment. Three new final tanks were also constructed. Two new chlorine contact tanks were installed with a total capacity of one million gallons. The hypochlorite storage and feed equipment was modernized and automated. Four new gravity thickeners were installed. Two of the original floating-cover digesters were modernized to fully mixed, high-rate digesters. The two other units were converted to sludge storage tanks. (Orr-FIRL)
W75-11701

NOVEL WASTE TREATMENT VARIATION SHOWS GREAT PROMISE,
C. Brucker.
Water and Pollution Control, Vol 113, No 6, p 17, 19, 37-39, June, 1975. 3 fig.

Descriptors: *Waste water treatment, *Sewage, *Activated sludge, Domestic wastes, Industrial wastes, Biochemical oxygen demand, *Settling basins, Sludge, Treatment facilities, Aeration, *Aeration, *Recycling.
Identifiers: Activation tank, *France, Cheese production wastes, *Brucker system.

A novel variation of the activated sludge technique for treating domestic sewage has been developed and patented. The Brucker system has been in operation in a plant in France for more than a year, and has been described as a single combined activation and settling tank that incorporates an aerating and recycling device. The unit treats waste water from a cheese plant at 170 kg of BOD per day. The waste receives no pre-treatment before entering the 180 cu m tank, and has a mean BOD of 2,000 mg/liter with peaks up to 5,000 mg/liter and pH from 4 to 11.5. The sewage is purified during its passage in horizontal flow through the single, combined, activation and settling tank of an elongated rectagular shape. Incoming sludge is received at the upstream end of the tank in a grit compartment bounded by a siphon partition. The tank has two zones, activation and settling, the volumes of which are variable. Sedimented sludge is sucked up by a screw pump, delivered upstream, and sprayed into the air. The oxygenated biological mass falls to the surface of the liquid in the tank, flocculates in the activation zone, and falls towards the bottom of the tank before being carried away by the screw pump to be recirculated. Energy consumption of the treatment plant is 130 kWh/day. (Murphy-FIRL)
W75-11702

THEY'RE PACKING UP WASTE PONDS.
Chemical Week, Vol 116, No 24, p 37, June 11, 1975.

Descriptors: *Packed beds, *Biological treatment, *Anaerobic digestion, *Liquid wastes, Microorganisms, Sewage Treatment, *Waste water treatment, Industrial waste, Methane.
Identifiers: Anflow unit, Biological reactors, Chemicals recovery.

An upflow packed-bed biological reactor, called an Anflow unit, has been developed by Union Carbide. This system is applicable for anaerobically treating liquid wastes from sewage and from various industries and in converting these wastes into chemicals or fuels. Liquid wastes are pumped into the bottom of this system and travel upward through the packing. Microorganisms have been implanted on the packing material and once they have been implanted they appear to regenerate without wearing out. One such column has operated for three years without adding to the microorganisms. The Anflow process can recover methane as off-gas during treatment of liquid wastes from starch, food processing, and from domestic sewage. The retention times for the system are as low as four hours. (Kramer-FIRL)
W75-11703

ALUMINUM SULPHATE FOR WATER TREATMENT.
Water Services, Vol 79, No 950, p 150-153, April, 1975.

Descriptors: *Coagulation, *Waste water treatment, Municipal wastes, Industrial wastes.
Identifiers: *Alum, Coagulants.

Aluminum sulfate, or alum, is used as a coagulant for both industrial and municipal water treatment. The alum provides gelatinous precipitate of hydroxide which by physical and electrochemical means entrains the suspended and colloidal matter present in water after filtration. Because most colloidal impurities in water have a negative charge, and alum is charged positively, collodial matter and particles of aluminum hydroxide floc are mutually attracted and form a precipitate which may be removed by filtration. The most economical form of alum for effluent treatment is Aluminoferric, available in slab block form; this substance is readily soluble in water and solutions of it can be metered into an effluent flow. (Kramer-FIRL)
W75-11704

TERTIARY STAGE ADDED TO STRATFORD SEWAGE PLANT.
Water and Pollution Control, Vol 113, No 5, p 14-16, May, 1975.

Descriptors: *Waste water treatment, *Tertiary treatment, *Treatment facilities, *Water quality standards, Filters, Flow, Rivers, Waste discharge, Biochemical oxygen demand, Canada.
Identifiers: *Effluent quality standards.

In order to meet stringent Canadian effluent quality standards, the city of Stratford, Ontario, was forced to improve its sewage treatment plant. Discharge is to a river of variable and sometimes very low flows, and the biochemical oxygen demand was to be limited to 300 pounds per day. The alternative chosen was tertiary treatment, built within the existing biological treatment facility. This supplemental effluent treatment consists of polishing by filtration, combined with nutrient removal. Better effluents were produced with the use of variable rate filters. A dual media filter was used with a larger size anthracite top layer above a finer sand layer. Backwash control was achieved by a differential pressure indicator for the flow in reverse direction to filtration. Performance tests on the new system indicated an average BOD5 value of 3.5 mg/liter. The tertiary treatment design capacity is 8 mgd. Thus, the maximum amount of BOD discharged on the river would be 280 lbs. BOD per day, which is within the required standards. (Kramer-FIRL)
W75-11705

THE ICI DEEP-SHAFT EFFLUENT-TREATMENT PROCESS.
Engineers' Digest, Vol 36, No 5, p 37, 39, May, 1975. 2 fig.

Descriptors: *Waste water treatment, *Biological treatment, Sewage, Effluents, Microorganisms, Sludge, Costs.
Identifiers: Northumbrian Water Authority, Billingham Sewage Works, *Deep-sharft effluent-treatment process.

A process has been developed for high-intensity biological treatment of sewage or biodegradable industrial effluent. Based on circulating the liquid effluent by an air-lift principle in a deep shaft, the process also entails maintaining a culture of microorganisms in the effluent which are easily supplied with air, so that high treatment can be achieved. The shaft is divided into two sections, a downcomer and a riser. At the shaft head is a gas disengagement basin. Compressed air is injected into the riser at shallow depth. As circulation is established, the air is transferred to the downcomer where it is deawn down by liquid flow.

Shaft depth can be from 100 to 300 meters achieved by conventional drilling and mining techniques. The air which provides the microorganisms with oxygen also initiates circulation, which makes the process simple and economical. Other advantages of this process are that the major part of the treatment stages are underground, thereby eliminating odor, and there is a minimal land requirement. The quantity of sludge produced is half that of the conventional activated sludge process, resulting in a substantial cost reduction. A pilot plant has been operating successfully since mid-1974 at the Billingham sewage works of the Northumbrian Water Authority. (Murphy-FIRL)
W75-11706

SIDROTHERM DESALINATION,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Technology.
B. A. Bolto.
Chemtech, p 303-307, May, 1975. 10 fig, 14 ref.

Descriptors: *Desalination, Effluents, Ion exchange, *Australia, Water treatment, *Waste water treatment, Resins.
Identifiers: *Sirotherm process.

An Australian desalination process has been developed which uses ion exchange resins but which achieves regeneration of the salt-loaded resins whith hot water, rather than with chemicals. The process is effective on waters having up to 3000 mg/liter is dissolved salts, but is not suitable for the treatment of seawater. This Sirotherm process is economically and environmentally feasible for desalting low-salinity waters of natural or industrial origin because there are no costs for chemicals and the amount of waste salt discharged in the effluent is reduced significantly. A mixture of weakly basic and weakly acid resins is utilized whereby exchange sites are formed by proton transfer from the acidic to the basic groups, as in the overall equilibrium which is heat-sensitive. In order to best use the thermal regeneration phenomenon, it was necessary to develop special resins with capacities for salt adsorption plus rapid reaction rates. ICI Australia has plans for building a commercial Sirotherm unit of 165,000 gpd capacity in an industrial factory in South Australia to demonstrate the application of the process in desalting low-salinity industrial facility waters. Future studies, such as the desalination of sewage effluent, which will require pre-treatment, are being considered. (Kramer-FIRL)
W75-11707

THE EFFECT OF TEMPERATURE ON THE AEROBIC DIGESTION OF WASTEWATER SLUDGE,
New Hampshire Univ., Durham. Dept. of Civil Engineering.
L. R. LePage.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 280, $4.75 in paper copy, $2.25 in microfiche. MS Thesis, June 1974. 81 p, 18 fig, 41 ref. OWRT A-030-NH(1).

Descriptors: *Sludge treatment, *Waste water treatment, *Temperature, Digestion, Aerobic conditions, Stabilization, Laboratory tests, Anaerobic digestion.
Identifiers: Temperature effects, *Aerobic digestion.

Small-scale laboratory experiments were performed on an undiluted primary waste water sludge to determine the effects of temperature on the aerobic digestion process. Conclusions include: greater reduction in BOD, COD, total solids, and total volatile solids occur at higher temperatures; digestion for periods longer than 15 days produced only a small improvement in the degree of stabilization; the effect of temperature on the degree of stabilization was more significant at shorter detention times; no correlation was found between temperature and settleability of the sludge; the settleability of treated sludge was less than that of the raw feed sludge; higher temperatures of digestion resulted in improved filterability of the treated sludge; after 15 days digestion at higher temperatures, the filterability of the treated sludge sharply dropped; filterability of digested sludge was not as good as the filterability of the raw sludge; aerobically digested sludge had no disagreeable odor either during aeration or filtration; at 5C, a longer detention time is required to reach stabilization and to improve the characteristics of the digested sludge than at higher temperatures; and, the time and effort required to achieve the same degree of stabilization is much less with aerobically digested primary sludge than with anaerobically treated sludge. (Orr-FIRL)
W75-11708

AEROBIC DIGESTION OF WASTEWATER SLUDGE UNDER LOW TEMPERATURE CONDITIONS,
New Hampshire Univ., Durham. Dept. of Civil Engineering.
P. L. Bishop, and L. R. LePage.
Available from the National Technical Technical Information Service, Springfield, Va. 22161, as PB-245 341, $3.25 in paper copy, $2.25 in microfiche. March, 1974. 17 p, 6 fig, 1 tab, 12 ref. OWRT A-037-NH(1).

Descriptors: *Waste water treatment, *Aerobic treatment, Digestion, *Sludge treatment, *Temperature, Laboratory tests, Odor, Stabilization.
Identifiers: *Aerobic digestion, Settleability.

The feasibility of winter operation of anerobic digesters in Hew Hampshire and other northern areas was examined. Small-scale laboratory experiments were conducted using continuous aeration, intermittent mechanical mixing, and a batch draw and fill operation, at six different temperatures ranging from 5 to 30C. Conclusions include: greater reductions in BOD, COD, Total solids and Total volatile solids occur at higher temperatures; digestion for periods longer than 15 days achieved only minimal improvement in stabilization except at temperatures below 5C; the effect of temperature on the degree of stabilization was more significant at shorter detention times; no correlation was found between temperature and settleability of sludge; the settleability of treated sludge was less than that of raw sludge; higher temperatures of digestion improved the filterability of the treated sludge; filterability was decreased after 15 days digestion at higher temperatures; the filterability of digested sludge was not as good as that of the raw sludge; and, no disagreeable odor of the aerobically digested sludge was found during aeration or filtration. (Orr-FIRL)
W75-11709

URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. Field, and D. Knowles.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1352-1369, June, 1975. 155 ref.

Descriptors: *Storm runoff, *Reviews, *Combined sewers, *Urban runoff, *Waste water treatment, Pollutant identification, Water management, Monitoring, Computers, Overflow, Bibliographies.
Identifiers: Nonpoint pollution sources.

A literature review of current research on storm water runoff and combined sewer overflow problems is presented. Nonpoint pollution sources are becoming increasingly important. Such urban land runoff pollutants include organic materials with significant amounts of oxygen demand and suspended solids, sediment from urban construction or erosion, unprotected croplands, air pollution fallout, heavy metals such as oil containing lead used for road dust control, highway deicing salts, and chemical fertilizers containing nitrogen and phosphorus. Alternatives for management of storm water pollution were categorized as: source control; collection system control; storage and treatment; and integrated (complex) systems. Runoff predictions using several mathematical methods were discussed. Effective combined waste water pollution abatement alternatives should combine control and treatment facilities. Pollution control may be achieved by computer monitoring and remote activation, by proper maintenance of drainage and sewer systems, by provisions for storage facilities, and, in some cases, by separation of sanitary and storm sewers. The applicability of biological, physico-chemical, and disinfection methods of treatment were compared, as related to overflow. The most promising approaches to urban storm flow management involve multidisciplinary systems, such as wet-period discharges, dry-period discharges, land use, and water use. Various sampling programs and flow meters are also being developed for analysis of sewer flow and waste water quality conditions. (Kramer-FIRL)
W75-11710

METEOROLOGICAL, TOPOGRAPHICAL, AND CONSTRUCTION INFLUENCE ON THE RAIN RUNOFF IN SEWER SYSTEMS (METEOROLOGISCHE, TOPOGRAPHISCHE UND BAUTECHNISCHE EINFLUESSE AUF DEN REGENABFLUSS IN KANAL-ISATIONSNETZEN),
S. Pfeiff.
Gesundheits-Ingenieur, Vol 96, No 5, p 140-142, May 1975.

Descriptors: *Sewers, *Rainfall, *Rainfall-runoff relationships, *Storm runoff, Design, Meteorology, Reviews, *Waste water treatment.
Identifiers: Sewer construction.

Meteorological, topographical, and construction influences on the storm runoff in sewer systems are presented. A critical review was made of existing calculation and design methods. Storm runoff analysis as applied presently in unsuitable for a proposed new coefficient-less method for network filling and runoff calculations. The runoff coefficient is unsuitable, and should be used only for approximate calculations as a ratio of the surface area with full runoff to the total runoff surface. Flow velocity as a parameter should be replaced by throughput in liters/sec and filling should be expressed in liters/min; the term runoff retardation should be abandoned completely. The course of rain over time is of great influence on the storm runoff in the sewer system. A late peak in rain intensity is less favorable for the filling of the sewer system than is an early peak. Analyses of the frequency of network filling in a well-defined water capture area should be used to dimension sewer systems rather than rainfalls yielding a runoff with a definite frequency. (Takacs-FIRL)
W75-11712

RECYCLING OF INCINERATOR ASH,
L. L. Diosady.
Environment Canada Research Report No 19, (1974). 82 p, 13 fig, 14 tab, 37 ref, append.

Descriptors: *Sludge treatment, *Incineration, *Phosphorus, *Heavy metals, Separation techniques, Iron, Aluminum, Pilot plants, Ultimate disposal, Recycling.

A preliminary study was performed on the feasibility of recovery of iron, aluminum, heavy metals, and phosphorus from incinerated sewage sludge ash. The project included a literature review; examination of ash composition, solubility

of ash components, and separation techniques; and an economic evaluation of separation methods and an estimation of the equipment needed for a pilot plant. Aluminum and iron recovery was found to be uneconomical. Aluminum was present in the ash in the form of a refractory oxide that is not amenable to any inexpensive chemical treatment. The ash was highly varied in composition. Approximately 50% of the ash was in the chemically inert form of silicates and alumina. A large proportion of all heavy metals, especially zinc and chromium, was physically or chemically bound by these refractories, which are not available through acid digestion. The simplest approach to safe ash disposal may be to form refractories from all ash components. By adding fluxing agents, or by altering the incinerator conditions, it may be possible to produce a glasslike ash that will contain much lower quantities of leachable heavy metals than the present ash. Phosphorus, present to the extent of 14-18% expressed as phosphoric acid, has the highest economic value in the ash. It may be recovered by the use of phosphoric or 60% sulfuric acids. (Orr-FIRL)
W75-11714

SLUDGE HANDLING AND DISPOSAL SEMINAR, CONFERENCE PROCEEDINGS NO. 2.
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
Held at Toronto, Ontario, September 18-19, 1974, 465 p. Published jointly with Environment Canada, Ottawa.

Descriptors: *Conferences, *Sludge disposal, Land, Crops, Nutrients, Legal aspects, Microbiology, Environmental effects, Centrifugation, Dewatering, Filtration, Incineration, Pumping, Cities, Treatment facilities, *Waste water treatment, *Canada.
Identifiers: *Sludge handling, Metal recovery, Metal removal, Phosphate removal, Hauling.

Twenty-eight papers, mostly by Canadian authors are presented. The subjects include disposal of sludge on agricultural land with relation to crop utilization of nutrients in the sludge, land reclamation, regulatory aspects, microbiological aspects, and the potential environmental hazards of this practice. Also covered is sludge handling with regard to centrifugation, dewatering, filtration, incineration, metal recovery or removal, phosphate removal, pumping and hauling. Sludge handling and disposal practices in a regional municipality and a metropolitan area are also discussed. (See W75-11716 thru W75-11731) (Dean-FIRL)
W75-11715

OVERVIEW OF CANADIAN SLUDGE HANDLING AND LAND DISPOSAL PRACTICES AND RESEARCH,
Ontario Ministry of the Environment, Toronto.
S. A. Black, and N. W. Schmidtke.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No. 2, September 18-19, 1974, Toronto, Ontario, Canada, p 1-9, (1974). 2 tab, 4 ref.

Descriptors: *Sludge disposal, *Anaerobic digestion, *Landfills, *Lagoons, *Canada, *Waste water treatment, Environmental effects, Phosphorus, Chemical precipitation, Great Lakes region, Treatment facilities.
Identifiers: Agricultural land, Canada-Ontario Agreement.

Sludge handling and disposal practices in some major Canadian cities and sludge handling practices in Ontario are discussed. The most widely used methods of disposal in Canada are anaerobic digestion, followed by placing the sludge in storage lagoons, sanitary landfills, or on agricultural lands without consideration of the environmental effect. Ontario is now involved in a phosphorus removal program. In the most critical areas of the Province the facilities were to have been in operation by December 1973, in less critical areas by December 1975, and all other areas three years after notification. Chemical precipitation will be used in the phosphorus removal facilities. Research studies included land application of sewage sludges and handling and treatment of sewage sludges under the Canada-Ontario Agreement. These studies should result in the upgrading of the treatment facilities in the Lower Great Lakes Basin. (See also W75-11715) (Dean-FIRL)
W75-11716

SLUDGE HANDLING AND DISPOSAL PRACTICES IN ENGLAND,
Agricultural Development Advisory Service, Leeds (England).
J. Webber.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 10-26, (1974). 11 tab, 12 ref.

Descriptors: *Sludge, *Sludge disposal, Land reclamation, Incineration, Bodies of water, Nitrogen, Phosphorus, Copper, Zinc, Lead, Cadmium, Mercury, *Waste treatment.
Identifiers: England, Wales, Composting, Farmland.

In England and Wales approximately 94% of the population has sewers. Four-fifths of the sewage is treated at sewage plants and used for agricultural purposes or otherwise disposed of on land. The remaining one-fifth is disposed of at sea or in estuaries after some pre-treatment. For disposal at sea, liquid sludge is taken out to deep water in specially designed barges where it is dumped. Studies of Liverpool Bay have shown no serious pollution but suggest that some accumulation of chemicals, pesticides, and metals might be harmful to marine life in the future. Sewage sludge has been used to reclaim the land at gravel pits and collieries with some success. Sewage farms near large centers of population are being used less frequently due to the value of the land for housing. Incineration and composting are other methods for sludge disposal that have been occasionally in use in England. Sewage sludge is also disposed of on agricultural lands where it is used as a source of nitrogen and phosphorus. Studies have shown that where sludges from industrial areas have been used there may be damage to crops from zinc and copper. When sludges include lead, cadmium, or mercury, there may also be a hazard to man and livestock consuming the crops. (See also W75-11715) (Dean-FIRL)
W75-11717

USE OF SEWAGE SLUDGE IN AGRICULTURE WITH ADEQUATE ENVIRONMENTAL SAFEGUARDS,
Agricultural Research Service, St. Paul, Minn.
W. E. Larson, R. H. Susag, R. H. Dowdy, C. E. Clapp, and R. E. Larson.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 27-45, (1974). 3 fig, 4 tab, 14 ref.

Descriptors: *United States, *Sludge disposal, *Sewage treatment, *Waste water treatment, Dewatering, Incineration, Land reclamation, Industrial wastes, Costs, Crop production, Food chains, Surface runoff, Farm management, Landfills.
Identifiers: Pollution regulations, Agricultural land, Soil productivity.

In the United States methods of handling and disposal of sewage sludge are being re-evaluated. The processing and disposal of sludge accounts for half of the cost of sewage treatment. In small communities disposal of sewage sludge by land spreading has been used for years. In larger communities dewatering followed by incineration has been used to dispose of sludge. Stricter air pollution restrictions and increased costs are making incineration less desirable. New pollution regulations applied to landfills require improved dewatering techniques. The most desirable alternatives is agricultural use of the sludge. The advantages of this method are increased crop yield and reclamation of land. An area of concerns is that heavy metals from industrial wastes may seep into the soil, causing reduced soil productivity and increases of heavy metals in the human food chain. A problem that could arise is pollution of surface water from runoff. This could be controlled by proper management. (See also W75-11715) (Dean-FIRL)
W75-11718

AEROBIC AND ANAEROBIC SLUDGE DIGESTION,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
B. I. Boyko.
In: Sludge Handling and Disposal Seminar Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 46-62, (1974). 3 fig.

Descriptors: *Anaerobic digestion, *Aerobic treatment, *Sludge treatment, *Waste water treatment, Enzymes, Microorganisms, Oxidation, Treatment facilities.
Identifiers: Acid fermentation, Alkaline fermentation, Organic pollutants.

The goal of water pollution control plants is to produce high quality effluents. This is achieved through the removal of organic pollutants, a process which produces quantities of sludge requiring pre-treatment before disposal. Digestion is the method by which these sludge solids are treated. Anaerobic digestion is a biochemical process taking place in the absence of oxygen through the action of enzymes and microorganisms. It is a two phase process consisting of an acid fermentation phase and a methane phase. Aerobic digestion is a biological process involving oxidation of bio-degradable matter by microorganisms and microbial cellular material by endogenous respiration. Both methods can be inhibited by toxic materials. When the two methods are compared for performance they should not be considered as equal alternatives for sludge treatment. The size and usage of the facility are among factors determining the choice of the method to be applied. (See also W75-11715) (Dean-FIRL)
W75-11719

DESIGN INFORMATION ON DEWATERING PROPERTIES OF WASTEWATER SLUDGES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. B. Farrell.
In: Sludge Handling and Disposal Seminar Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 269-279 (1974). 1 fig, 2 tab, 11 ref.

Descriptors: *Sludge treatment, *Dewatering, *Nutrient removal, Phosphorus, Lime, Aluminum, Iron, Equipment, Costs, Treatment facilities, *Waste water treatment.
Identifiers: Sludge yield.

Information on the handling of sludges produced by phosphate removal processes is presented. To design a minimum cost facility, it is necessary to 'cost out' a number of potential process options in order to identify the more economical approaches. A large part of the plant cost is dewatering. Tables are presented whereby sludge yields can be estimated. The mass of chemical sludge produced when iron or aluminum salts are used has usually been estimated from simplified stoichiometric relationships; however, experimental data suggest that these estimates are low and should be increased by up to 35%. The mass of sludge produced by lime addition depends on the dose of

lime required, the alkalinity of the waste water, and to a small degree on the phosphate content of the waste water. Calculated lime sludge doses should be increased by 20%. Field visits have also been made to plant sites with a sludge dewatering trailer. The site visits make it possible to compare effectiveness of various dewatering devices, compare the performance of the dewatering equipment at the plant with the equipment in the trailer, and observe at a number of sites how the performance of each device is affected by differences in sludge type and waste water source. (See also W75-11715) (Orr-FIRL)
W75-11722

EFFECTS OF CONTROL VARIABLES AND SLUDGE CHARACTERISTICS ON THE PERFORMANCE OF DEWATERING AND THICKENING DEVICES,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
H. Campbell, and B. P. LeClair.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 280-314, (1974). 13 fig, 2 tab, 10 ref.

Descriptors: *Treatment facilities, *Waste water treatment, *Water quality, Sludge treatment, *Dewatering, Great lakes, Pilot plants, Effluents, Centrifugation, Polymers, Nitrogen, Carbon, Phosphorus, Waste treatment.
Identifiers: Air flotation unit, Gravity thickner.

The Canada-Ontario Agreement on Great Lakes Water Quality of August 1971 insures the restoration and protection of the Great Lakes water quality. A drastic reduction of nitrogen, carbon, and phosphorus in waste treatment plant effluents is specified in the agreement. A program is described to measure sludge production, characterize the physical and chemical properties of sludges, and correlate these properties with various sludge dewatering processes. Equipment included mobile pilot-scale dewatering units and a mobile bench-pilot scale sludge dewatering facility. Various centrifuges and filters as well as the air flotation unit and gravity thickener were used. Sludges were taken from an extended aeration pilot plant and activated sludge plants at two locations in Ontario. A polymer was used in the separation process in the centrifuges. In the solid bowl centrifuge the polymer dosage was an important adjustable control variable. For all sludges, 99% solids recoveries were possible. The cake solids were not as susceptible to control variables as solids recovery. In the basket centrifuge, polymer addition was necessary to produce a high recovery when digested alum sludge was used, while for waste activated sludge recovery in excess of 90% was possible without the addition of a polymer. Centrifugation gave the greatest degree of thickening but for clarification of waste activated sludge, air flotation was superior. (See also W75-11715) (Dean-FIRL)
W75-11723

THE USE OF PHYSICOCHEMICAL SLUDGE CHARACTERISTICS AND BENCH DEWATERING TESTS IN PREDICTING THE EFFICIENCY OF THICKENING AND DEWATERING PROCESSES,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
R. Stickney, and B. P. LeClair.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18019, 1974, Toronto, Ontario, Canada, p 315-350, (1974). 9 fig, 11 tab, 12 ref.

Descriptors: *Treatment facilities, *Sludge treatment, Effluents, Nitrogen, Carbon, Phosphorus, Algae, Dewatering, *Waste treatment.
Identifiers: Phosphorus removal, Lime treatment.

The Canada-Ontario Agreement on Great Lakes Water Quality of 1971 specifies that the levels of nitrogen, carbon, and phosphorus considered essential for the growth of algae be drastically reduced in waste treatment plant effluents. Pilot plant studies provided data on sludge production and properties. Sludge production and characteristics were altered by adding phosphorus removing chemicals. These chemical additions resulted in an increase in total solids production and sludge volume and had a harmful effect on dewatering characteristics. In most cases the introduction of chemical treatment will result in the need to increase sludge handling facilities. Lime treatment is the notable exception. The improvment in dewatering was such that the handling facilities could be reduced even though the sludge solids increased. (See also W75-11715) (Dean-FIRL)
W75-11724

CENTRIFUGES - TYPES AND APPLICATIONS,
Penwalt Corp., Warminster, Pa. Sharples-Stokes Div.
F. W. Keith, Jr.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 351-368, (1974). 10 fig.

Descriptors: *Treatment facilities, *Sludge, Polymers, Centrifugation, *Waste water treatment, Equipment, Industrial wastes, Municipal wastes, Sludge treatment, Thickening, Dewatering.
Identifiers: *Centrifuges, Disc centrifuge, Scroll centrifuge, Imperforate bowl knifing centrifuge.

Three types of centrifuges are currently being used in municipal and industrial waste treatment plants for thickening or dewatering. The scroll type centrifuge is most commonly used. Because of its design it can be used for almost all sludges containing primary solids as well as for those with lime added for phosphorus removal. In order to handle soft secondary sludges a polymer must be added. The imperforate bowl knifing centrifuge has been successful with biological sludges and handles alum sludges readily. The main advantage is a recovery of 90-95% without a polymer. The disc centrifuge is used for the thickening of clean secondary activated sludge. It has had recovery rates of 85-90% without a polymer. The three types of centrifuges may be used separately or in combination. (See also W75-11715) (Dean-FIRL)
W75-11725

SLUDGE DEWATERING USING THE KRUGER CENTRIFUGE,
L. P. Roe.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 369-384. (1974) 1 fig.

Descriptors: *Dewatering, *Sewage sludge, Canada, Polymers, Equipment, Centrifugation, *Waste water treatment, Operation.
Identifiers: *Centrifuges(Kruger).

The use of solid bowl decanter centrifuges for dewatering sewage sludges is now becoming common in Canada. The decanter centrifuge advantages are that it requires little operator attention and operates continuously. Its disadvantages are wear on the solids conveying scroll by the abrasive action of grit in the sludge and poor solids capture. Work has been done to overcome these disadvantages. Design iniprovements were made and the use in recent years of synthetic polymer flocculant aids has improved the solids capture. By lowering the g-force and scroll differential speed and by using an efficient degritting system abrasive wear can be lowered. Sludge dewatering investigations have been carried out at various treatment plants in Canada using the improved centrifuge. Performance varied according to the type of sludge. The decanter centrifuge is relatively easy to maintain, having only two major moving parts; the scroll and the bowl. The solid conveying scroll requires the most maintenance. To shorten the downtime, it would be advantageous to have a spare scroll available. (See also W75-11715) (Dean-FIRL)
W75-11726

VACUUM DEWATERING OF SEWAGE SLUDGE,
G. D. Kemp.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 385-390, (1974). 2 fig, 1 tab.

Descriptors: *Filters, *Dewatering, *Sludge, Lime, Polyelectrolytes, *Waste water treatment, Sludge treatment, Activated sludge, Canada.
Identifiers: *Vacuum filters, Ontario, Ferric chloride, Alum.

Vacuum filters are being used at plants in Ontario to dewater raw sludge conditioned with polyelectrolytes or ferric chloride and lime, and in one case thickened waste activated sludge conditioned with a polyelectrolyte. The filter mediam used in many of the filters in Ontario are stainless steel springs. Fabric is the other filter medium used. The purpose of a vacuum filter is to achieve the dryest filter cake using the least amount of coagulant at the highest drum speed. Tests can be made to determine the proper amount of coagulant needed. Alum, lime, or ferric chloride are being used for reduction of nutrients at most of the plants using vacuum filters. Alum has had some effect on the amount of filter yield while lime and ferric chloride have not. (See also W75-11715) (Dean-FIRL)
W75-11727

ASPECTS OF INCINERATING CHEMICAL SLUDGES,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
E. E. Shannon, D. Plummer, and P. J. A. Fowlie.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 391-412, (1974). 8 fig, 7 tab, 15 ref.

Descriptors: *Incineration, *Sludge disposal, Waste disposal, Municipal wastes, North America, Europe, Dewatering, Sludges, Canada, United States, *Waste treatment.
Identifiers: Furnaces.

Incineration has been used as one of the cheapest methods of sludge disposal by large municipalities. The three types of incinerators are the multiple hearth furnace which is the most common method of incinerating sewage sludges in North America and Europe, the fluidized bed furnace, and the rotary kiln furnace which has not been extensively used although it has the potential for handling thickened sludge directly. In incineration systems the most critical pretreatment step is sludge dewatering. In view of the potential problems involved in the incineration of phosphorus removal sludges, a sludge incineration and precipitant recovery program was initiated. The preliminary results showed that the calorific value of the chemical sludges varies with the type of sludge. The lime sludge did not present any problems but with the alum and iron sludges there is the possibility of clinker build-up. It is possible to recover iron and other heavy metals from incinerator ash. S(See also W75-11715) (Dean-FIRL)
W75-11728

REMOVAL OF PHOSPHATES AND METALS FROM SEWAGE SLUDGES,
Waterloo Univ., (Ontario). Dept. of Chemical Engineering.
D. S. Scott, and H. Horlings.

In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 413-443, (1974). 5 fig, 7 tab, 6 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Nutrient removal, Sludge, Iron, Aluminum, Zinc, Phosphates, Phosphorus, Heavy metals, Filters, Extraction, *Chemical precipitation.
Identifiers: Agricultural land, *Phosphate removal, Experimental work, Chemical treatment.

Now that waste water treatment plants are using chemical treatment for the removal of phosphates the sludges produced will not only contain phosphate but metals such as iron and aluminum used as coagulants or in the removal process. The sludges will also contain the phosphorus and metals that entered the plant. The removal of phosphates and metals from sewage sludges has become important particularly when the sludges are used on agricultural lands. Experimental work has been done on the extraction and precipitation of metals from filter cake. The metals and phosphorus could be extracted by acid from either unconditioned or conditioned final anaerobic digested sludges. The control of the pH was important in the production of solid products containing iron and aluminum in one case and heavy metals in the other. Iron, aluminum, zinc, and phosphate can be recovered by further treating the solid products by conventional means. (See also W75-11715) (Dean-FIRL)
W75-11729

SLUDGE HANDLING AND DISPOSAL PRACTICES IN THE REGIONAL MUNICIPALITY OF NIAGARA,
Regional Municipality of Niagara, Niagara Falls (Ontario). Public Works Dept.
E. R. Simonen.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, Toronto, Ontario, p 444-451, (1974). 2 tab.

Descriptors: *Treatment facilities, Anaerobic digestion, Aerobic treatment, *Sludge disposal, Research and development, Landfills, Sludge treatment, Canada, Sludge treatment, Waste water treatment.

An act of the provincial government established the Regional Municipality of Niagara on January 1, 1970. The area is 719 square miles with a population of approximately 350,000. The region is comprised primarily of rural and agricultural land with about 70% of the population concentrated at St. Catharines, Niagara Falls, and Welland. At present the region has twelve sludge producing plants. This will be reduced to eight as new plants are completed. Anaerobic digestion is used except at the Crystal Bay, Chippawa, and Grimsby plants. Aerobic digestion is used at the Crystal Bay plant. The Chippawa plant will be phased out upon completion of the south side sewer scheme at which time its sludge will be treated at the Niagara Falls plant. Ainoperative digester is being used as a holding tank for raw sludge at the Grimsby plant and the sludge is treated at one of the larger plants. The digested sludge in the region is disposed of on land, offered to the public for use, or disposed of at landfills. The region has also been involved in research projects. Various types of vehicles for spreading sludge on fields were tested amd a spraying system was investigated. Computer selection of various sludge disposal alternatives was evaluated. (See also W75-11715) (Dean-FIRL)
W75-11730

SLUDGE HANDLING AND DISPOSAL PRACTICES IN METROPOLITAN TORONTO,
W. A. Salib.
In: Sludge Handling and Disposal Seminar Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 452-465, (1974) 1 fig, 2 tab.

Descriptors: *Treatment facilities, *Sewerage, *Sludge disposal, Anaerobic digestion, Polymers, Lime, Centrifugation, Filtration, Incineration, Landfills, Dewatering, Canada, *Waste disposal, *Waste water treatment.
Identifiers: *Toronto(Canada), Thermal processing, Ferric chloride.

In 1954 when Metropolitan Toronto was created there were 17 treatment plants operating in Toronto and its suburban municipalities with two plants under construction. A sewerage system plan put into effect in 1954 provided for trunk sewers to convey waste water to four major plants. By the 1960's the smaller plants had been taken out of service and the sludge disposal consolidated at the four treatment plants. All four plants process the sludge by anaerobic digestion followed by conditioning with polymers or ferric chloride and lime then centrifugation or vacuum filtration. The sludge is disposed of by hauling to landfill areas, incineration, or air drying storage and removal by the public for use as soil conditioners. Future plans for expansion of the main treatment plants are as follows: Highland Creek Treatment Plant will increase its capacity from its present 16 mgd to 64 mgd and the sludge will be processed by thermal processing, dewatering and incineration; Humber Treatment Plant will increase from 62 mgd to 120 mgd and the sludge dewatered and hauled to the Main Treatment Plant for incineration; and modernization of the present facilities is under consideration for the North Toronto Treatment Plant. (See also W75-11715) (Dean-FIRL)
W75-11731

HEAT TREATMENT OF SEWAGE SLUDGE,
Public Works Research Inst., Tokyo (Japan).
K. Saito.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 20-64, May 1975 6 fig, 12 tab.

Descriptors: *Sewage treatment, *Sludge treatment, *Heat treatment, Dewatering, *Waste water treatment, Maintenance, Recycling, Equipment, Costs, Sludge, Odor, Treatment facilities.
Identifiers: Japan, Odor removal.

Results of a three-year investigation of facilities for heat treatment of sewage sludge are presented. Care must be taken for prevention of corrosion and organic deposition. Heat treated sludge dewaters easily and can be burned without the use of additional fuel. However, three major problems of this method persist. These are: removal of odors from the treatment process; treatment of supernatants having high BOD, including removal of nitrogen compounds and heavy metals; and the need to establish operation and maintenance systems for periodic inspection. In order to implement a heat treatment system, optimum operating conditions must be determined by quality of supernatant for each particular sewage treatment facility. It is desirable to establish a closed system for heat treatment, where heat from incineration of the cake is recycled and odorous gases are reused as combustion air. In addition, it is recommended that equipment be standardized in order to simplify quality control and for cost reduction. (Prague-FIRL)
W75-11732

COMBINED TREATMENT OF MUNICIPAL AND INDUSTRIAL WASTEWATER,
Yokohama Sewerage Bureau, Kanagawa (Japan).
M. Sato, H. Fujii, and S. Yasuda.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 65-127, May 1975 12 fig, 24 tab.

Descriptors: *Waste water treatment, *Pre-treatment, Industrial wastes, Municipal wastes, Facilities, Aeration, Oxygen.
Identifiers: *Combined municipal-industrial waste treatment, *Kyoto(Japan).

Systems for combined treatment of municipal and industrial waste water require consideration of technical knowledge, expense allotment, and administrative measures. Factors concerning combined treatment are discussed for systems with and without pre-treatment of industrial waste waters. Described are the Torihama industrial waste water pre-treatment plant, the combined treatment of industrial and domestic waste water at Shingashi Valley, and the combined treatment of industrial and municipal waste water in kyoto. In the Kyoto treatment plant, comparisons between pure oxygen aeration and the conventional air system demonstrated that pure oxygen aeration is useful for treatment of highly polluted sewage with a variable load. (Prague-FIRL)
W75-11733

STUDIES ON ADVANCED WASTE TREATMENT,
Public Works Research Inst., Tokyo (Japan).
M. Kashiwaya, and S. Nanbu.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 128-188, May 1975 24 fig, 17 tab, 4 ref.

Descriptors: *Tertiary treatment, *Lime, Pilot plants, Municipal water, Activated sludge, Filtration, Adsorption, Suspended solids, Biological treatment, *Waste water treatment, *Chemical precipitation.
Identifiers: *Japan, Water quality matrices, *Chemical treatment.

Results of laboratory and pilot scale tests concerning lime precipitation in municipal waste water are given from two areas in Japan. Pilot plant installations at the Shita-machi Sewage Treatment Plant in Yokosuka and at the partially completed Toba Sewage Treatment Plant in Kyoto are described. In Japan, 71% of the municipal sewage treatment plants use the activated sludge method. However, organic suspended solids are not always removed from the final settling tanks of this process. The down-flow filtration process is being investigated, as well as an up-flow type granular activated carbon adsorption system. Treatability of waste water may be evaluated, based on water quality matrices; variables used were impurity size, chemical property, and concentrattion. For removal of organics, three water quality indices such as TOC, and ultraviolet absorbance of 260 (E260) and 220 (E220) millimicron meters connected with impurity size distribution could describe the usefulness of biological treatment, chemical coagulation, carbon adsorption, or other treatment processes. (Prague-FIRL)
W75-11734

TREATMENT AND DISPOSAL OF SLUDGE FROM MUNICIPAL WASTEWATER PLANTS IN THE UNITED STATES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. B. Farrell.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 223-233, May 1975 3 tab, 11 ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Wastes disposal, *Sewage treatment, Incineration, Anaerobic digestion, Heat treatment, Equipment, Filters, Centrifuges, Economics, *Sludge treatment.
Identifiers: *Sludge conditioning.

Various methods used for treatment and disposal of sludge from municipal waste water treatment plants in the United States are described. Because secondary treatment is a national goal, an increase in the amount of secondary and chemical sludges is expected. The largest percent of sewage sludge is disposed to land while a substantial proportion is incinerated with the ash disposed to land. Ocean disposal is not viewed as a favorable method for the future. Types of stabilization are compared, including anaerobic digestion, aerobic digestion, chlorine stabilization, and lime stabilization. Sludge conditioning may be approached by treatment with inorganic chemicals, polymers, or heat. Dewatering methods are dependent on solids content; types of filters and centrifuges are described. Guidelines for disposal by means of incineration, landfill, or by landspreading are evaluated as is the economic viability of each alternative. (Prague-FIRL)
W75-11735

EXPERIENCES WITH SLUDGE HANDLING IN TEXAS,
Texas Water Quality Board, Austin.
D. Whittington.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 239-244, May 1975 4 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Texas, *Waste water treatment, Rural areas, Urban areas, Dewatering, Anaerobic digestion, Activated sludge, Municipal wastes.
Identifiers: *Sludge handling, *Land application.

Sludge handling in small plants in rural areas of Texas is successfully accomplished by anaerobic digestion with dewatering on open beds and subsequent land application. For small plants located in urban areas, a trend is toward aerobic rather than anaerobic digestion. This is due to extensive use of contact stabilization treatment plants which run best utilizing aerobic digestion, and various nuisance problems which are associated with anaerobic sludge handling. One technique used in Houston, for transporting excess activated sludge from plants with no dewatering facilities to a sludge processing plant is the pumping of sludge via pressure conduits to a sanitary sewer which then flows to major plants. At larger municipal plants, a variety of sludge disposal techniques have been applied. Descriptions are given of the sewage treatment facilities of the City of Houston, the Gulf Coast Waste Disposal Authority, the City of Austin, and the City of San Antonio. Larger plants in arid areas will continue utilizing sludge lagooning where feasible. Where final disposal is nearby landfill, vacuum filters will be used for dewatering; where ultimate disposal is fertilizer production or long-distance landfill, pressure filters are likely to be used. (Prague-FIRL)
W75-11736

SLUDGES GENERATED IN PHOSPHATE REMOVAL PROCESSES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. B. Farrell.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 271-282, May 1975 2 fig, 10 tab, 5 ref.

Descriptors: *Nutrient removal, *Phosphates, *Aluminum, *Iron, *Lime, *Waste water treatment, Dewatering, Pilot plants, Facilities.
Identifiers: Physico-chemical treatment, Sludge volume, Thickening, Clarifiers.

When aluminum salts, iron salts, and/or lime are used in the physical-chemical treatment of waste water to remove phosphate, the sludge mass increases and dewatering properties are affected. The masses of sludge formed from each treatment can be calculated from chemical equations. Aluminum and iron salts generally reduce the solids content of primary clarified sewage so that sludges cannot be thickened to as high a solids content. With lime, the opposite result occurs. Thickening and dewatering properties are substantially improved and sludge conditioning agents can often be eliminated. While the mass of sludge is generally higher with lime treatment, the volume is often lower than when Al or Fe salts are used. Tests of treatment with these chemicals were conducted under plant conditions at Little River, Ontario, and at Blue Plains in Washington, D.C., at Contra Costa, California, and at Salt Lake City, Utah. Results indicated excellent sludge characteristics, such as filter yielded and sludge concentration, with lime treatment. Modifications in clarifier design are being investigated to improve Al and Fe sludge treatment. (Prague-FIRL)
W75-11737

EPA EXPERIENCES IN OXYGEN-ACTIVATED SLUDGE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
E. F. Barth.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings February 12-16, 1974, Tokyo, Japan, p 283-357, May 1975, 26 fig, 26 tab, 7 ref.

Descriptors: *Aeration, *Oxygen, *Waste water treatment, Biological treatment, Treatment facilities, Sludge treatment, Sludge disposal, Administration, *Sewage treatment.

The role of the EPA between 1968 and 1974 in the development of the oxygen aeration process is summarized. Facilities from seven projects are detailed. These are: Batavia I and II (Union Carbide Corporation), the purpose of which was to establish the feasibility of a multi-stage, covered-tank oxygenation concept; Newtown Creek (New York City), where scaled-up demonstration of the multi-stage, covered-tank oxygenation system was investigated; Las Virgenes (California) Municipal Water District, which demonstrated the single-stage, covered-tank oxygenation system; FMC Corporation, which hoped to establish the feasibility of the open-tank oxygenation concept; the EPA/District of Columbia (Blue Plains) Pilot Plant, to determine the process kinetics over a wide range of operating conditions; the Bureau of Reclamation, which tested materials of construction for corrosion potential; and the Rocketdyne Division of Rockwell International, which planned to define safety requirements and to develop a safety manual and checklist. As a result of these studies, it was concluded that oxygenation systems are equally applicable to the construction of new facilities and the upgrading of existing secondary treatment plants. Such systems should be designed as integrated packages, with a biological reactor, a secondary clarifier, and sludge handling equipment. Further work should verify or contradict data which indicate that reduced excess biological sludge production is possible with oxygenation. (Prague-FIRL)
W75-11738

AERATION SYSTEMS FOR METRO CHICAGO,
Metropolitan Sanitary District of Greater Chicago, Ill.
B. T. Lynam, S. Graef, and D. Wunderlich.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 358-392, May 1975 5 fig, 5 ref.

Descriptors: *Aeration, Design criteria, Treatment facilities, Mathematical studies, Activated sludge, Economics, *Waste water treatment, Illinois.
Identifiers: *Chicago(Ill), *Bubble aeration.

Aeration systems for the greater Chicago area are described. Development of aeration technology involved diffuser plate studies for permeability, uniformity, and diffuser plate rating. More recent work concerned instream aeration, basin aeration, and small plant design and modification. Fine bubble aeration practices, involving intakes, filters, blowers, air mains, and aeration tanks, are detailed. From investigations since 1920, the Metropolitan Sanitary District of Greater Chicago has made contributions in diffuser permeability criteria, design and operation of primary and secondary air filters, and aeration tank configuration and diffuser placement. Mathematical relationships for oxygen transfer have been formulated. An overall effective economic technology for activated sludge treatment has been developed. (Prague-FIRL)
W75-11739

OXYGEN ACTIVATED SLUDGE SYSTEMS IN TEXAS,
Texas Water Quality Board, Austin.
D. Whittington, and T. B. Tischler.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 393-399, May 1975 3 ref.

Descriptors: *Waste water treatment, *Texas, *Sludge treatment, Odors, Oxygen, Personnel, Operation, Maintenance, Monitoring, Economics, Municipal wastes, *Activated sludge.
Identifiers: *Unox Process, Hydrocarbons, Pure oxygen treatment.

Pure oxygen systms for waste treatment, particularly the Unox Process, are discussed in terms of the applicability of this system to facilities in Texas. Four small to medium size Unox systems are under construction or in planning stages for Texas municipalities. The advantages of this process include reductions in biological reactor volumes, higher oxygen-transfer efficiencies, improved sludge handling characteristics, simplified process control, and odor control. Some possible disadvantages are that the more sophisticated mechanical and electrical control systems may not be operated by all treatment plant personnel. Also, there is a possibility of volatile hydrocarbons entering the enclosed system, which could lead to a serious explosoion. For this reason, a monitoring device for hydrocarbons is installed in each Unox unit, and should be properly maintained. Because of reduction of tank volumes and land area needed, the Unox process may be a viable future alternative to conventional activated sludge treatment for Texas. This is especially trud in large municipal plants, where an economic advantage results. (Prague-FIRL)
W75-11740

SUSPENDED SOLIDS REMOVAL PROCESSES STUDIED AT METRO CHICAGO,
Metropolitan Sanitary District of Greater Chicago, Ill.
B. T. Lynam, D. R. Zenz, C. Lue-Hing, and G. R. Richardson.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 400-488, May 1975 15 fig, 4 tab.

Descriptors: *Suspended solids, *Waste water treatment, *Pilot plants, Hydraulic properties, Filters, Filtration, Effluents, Equipment, Solid wastes, Illinois, Treatment facilities.
Identifiers: *Hydraulic loading, *Microstrainers, *Chicago(Ill).

Metro Chicago has investigated its suspended solids removal processes by full-scale and pilot studies. At Hanover Park, a full-scale evaluation of sand filtration and microstraining was carried out in order to determine maximum suspended solids loading and maximum hydraulic loading to both the sand filter and the microstrainer. Pilot

plant studies evaluated three devices, the DeLaval filter, the Neptune Microfloc Unit, and the Graver Filter. All filtration units were capable of producing effluent suspended solids and BOD of under 10 mg/liter. The Graver pressure filter can be successfully operated at higher hydraulic loadings (9.0 gpm/sq ft) and suspended solids loadings (1.9 lbs/sq ft) than the other two units. The Neptune Microfloc Unit achieved the best effluent quality, with less than 6.0 mg/liter of suspended solids and BOD. A 15 mgd rated capacity microstrainer at the north side treatment works of the District was also evaluated. The various test results were compared, indicating that microstrainer flow capacity is very much dependent upon the type of effluent solids. Additionally, sand filters are capable of achieving better suspended solids removal than microstraining devices, and batch type filters appear to be capable of loadings over 1.2 lbs/sq ft/filter run. (Prague-FIRL)
W75-11741

METRO CHICAGO STUDIES ON NITRIFICATION,
Metropolitan Sanitary District of Greater Chicago, Ill.
B. T. Lynam, D. R. Zenx, C. Lue-Hing, G. R. Richardson, and B. T. Washington.
In: 3rd US-Japan Conference on Sewage Treatment Technology Proceedings, February 12-16, 1974, Tokyo, Japan, p 449-503, May 1975 17 fig, 5 tab, 6 ref.

Descriptors: *Nitrification, Ammonia, Nitrogen, *Waste water treatment, *Illinois, *Treatment facilities.
Identifiers: *Chicago(Ill).

Nitrification was tested in the Chicago area at three facilities. A two-stage nitrification process at Hazlecrest, Illinois, produced an effluent high in nitrate-nitrite and low in ammonia concentrations at a 3.0 to 5.0 hour detention time in the second stage. Temperature effects were a major factor for both initiating and maintaining nitrification. At the Calumet Sewage Treatment Plant, a pilot plant process steps included preliminary and secondary treatment, anaerobic sludge digestion, and contact chlorination. Under such a second-stage nitrification system, a nitrified effluent with an ammonia nitrogen residual of under 2.5 mg/liter could be produced with: influent NH3-N, 10 to 25 mg/liter, SRT of at least ten days, and a minimum operating temperature, 12 to 15C. A Water Reclamation Plant at Lemont, used nitrification and employed extended aeration. When operated at long detention times, with sewage temperatures as low as 45 F, a well-nitrified effluent was produced. The concept of single-stage nitrification at all major plants in the Chicago area is being tested a pilot scale levels. A new plant under construction at West-Southwest will have a maximum flow capacity of 26 mgd, detention time, 5.5 hours, with return sludge flow capability of 26 mgd. The Metropolitan Sanitary District of Greater Chicago policy toward nitrification at future full-scale plants has not yet been decided. (Prague-FIRL)
W75-11742

A SURVEY OF THE TOKYO METROPOLITAN SHIN-KASHI TREATMENT PLANT, (TOKYO-TO SHINKASHI SHORIJO NO GAIYO),
T. Nagahama.
Gesuido Kyokai-shi, (Jour Japan Assn of Sewage Works), Vol 11, No 125, p 67-75, 1974.

Descriptors: *Waste water treatment, *Sewage treatment, *Industrial wastes, Municipal wastes, Precipitation(Chemical), Facilities.
Identifiers: *Tokyo(Japan).

The Tokyo Shin-Kashi sewage treatment plant, an advanced and final stage treatment plant which is needed to keep the water quality to a pH between 5.8 to 8.6, to below 20 mg/liter for BOD, and to below 70 mg/liter for SS, is described. The plant treats both municipal waste water and treated industrial waste water which have flowed into the plant through separate drainages. The total input of water to the plant is 380,000 cu m/day and is expected to increase to 940,000 cu m/day with the completion of other drainages now under construction. The industrial waste water is pre-treated separately from the municipal waste water. A pH adjustment, additional aeration treatment, and chemical precipitation treatment are given to the industrial water before mixing it with municipal waste water at a pre-aeration tank. The mixed waste water is fed into a primary precipitation pond, then an aeration tank, a final-precipitation pond, and a chloride mixing tank. The purification efficiency of waste water in this plant is much higher than those plants treating the mixture of both municipal and industrial water without industrial water pre-treatment. Both operational and dimensional details of individual treatment facilities are presented. (Katayama-FIRL)
W75-11743

DIMENSIONING AND DESIGN OF SMALL WASTE WATER PUMPING STATIONS (BEMESSUNG UND GESTALTUNG VON KLEIN-ABWASSERPUMPWERKEN),
For primary bibliographic entry see Field 8C.
W75-11744

THE INFLUENCE OF TEMPERATURE ON THE BIOLOGICAL OXIDATION OF URBAN WASTE WATERS BY MEANS OF AN ACTIVATED SLUDGE (INFLUENZA DELLA TEMPERATURE NELLA OSSIDAZION BIOLOGICA DEI LIQUAMI URBANI MEDIANTE FANGHI ATTIVI),
M. Bolla, and G. Dini.
Rassegna Chimica, Vol 26, No 3, p 155-158, May/June, 1974. 2 fig.

Descriptors: *Waste water treatment, *Activated sludge, *Water temperature, *Biological treatment, Organic matter, Municipal water, Biochemical oxygen demand, Nitrification, Municipal waste, *Oxidation.

The influence of temperature, activated sludge concentration, and retention time on the biological oxidation of organic matter in urban waste water was studied. The BOD5 values decreased with increasing temperature in the temperature range of 10 to 20 C. The rate of nitrification was a function of the temperature, the hold time, and the activated sludge concentration. At an activated sludge concentration of 4700 to 6000 ppm, a retention time of 3 to 4 hours was required at 18 C. At an activated sludge concentration greater than 6000 ppm, the reaction time must be 4 hours and the temperature 15 C. With the activated sludge concentration under 6000 ppm, the reaction time must be increased accordingly. Diagrams for the determination and coordination of the activated sludge concentration, temperature, and retention time for a given residual BOD value or ammonium nitrogen content are presented. (Takacs-FIRL)
W75-11745

PHOSPHATE PRECIPITATION IN ACTIVATED SLUDGE PLANTS WITH SLUDGE STABILIZATION AND DENTRIFICATION (PHOSPATFAELLUNG IN BELEBUNGSANLAGEN MIT SCHLAMMSTABILISATION UND DENITRIFIKATIONSSTUFE),
K. H. Kienzle.
Vom Wasser, Vol 42, p 329-369, 1974. 16 fig, 9 tab, 14 ref.

Descriptors: *Activated sludge, *Waste water treatment, Phosphates, Nitrogen, Alum, Efficiency, Precipitation(Chemical), Biochemical oxygen demand, Facilities, *Denitrification, Oxidation.

Activated sludge plants with sludge stabilization were studied both in laboratory scale plants and in a full scale oxidation ditch. The study investigated the influence of precipitation of phosphate on both the purification effect and the nitrogen elimination efficiency. Phosphate elimination due to adding ferrous (III)-chloride was not sufficient. The precipitant caused a lowered pH value in the plants and negatively influenced the activated sludge. Thus, the purification efficiency of the plants decreased, particularly regarding BOD5 degradation and nitrogen elimination. With alum precipitation, the efficiency was over 90%, with effluent concentrations of less than one mg total phosphorus per liter. In this case, BOD5 and nitrogen elimination were not negatively influenced. A low nutrient content in the effluent of activated sludge plants with sludge stabilization and a pre-step denitrification may be obtained by the simultaneous addition of aluminum for phosphate precipitation. (Prague-FIRL)
W75-11746

EXPERIENCE OF THE RUHRVERBAND WITH THE TREATMENT OF SEWAGE SLUDGE (ERFAHRUNGEN DES RUHRVERBANDES BEI DER KLAERSCHLAMMBEHANDLUNG),
R. Imhoff.
Gas-und Wasserfach-Wasser/Abwasser, Vol 116, No 5, p 216-221, May, 1975. 6 fig, 3 tab, 6 ref.

Descriptors: *Sewage treatment, *Sludge disposal, Waste treatment, *Waste water treatment, Waste disposal, Dewatering, Aerobic treatment, Sludge treatment, Activated sludge, Stabilization, *Treatment facilities.
Identifiers: Composting, Ashing, Germany.

Sewage sludges must be stabilized prior to disposal. This can be achieved by rotting, aerobic stabilization, composting, or ashing. The Ruhrverband in the Federal Republic of Germany operates 115 small water purification plants; on the average only 33,000 residents are served per plant. For these systems, primarily digestion tanks are used. Nine plants with population equivalents of less than 10,00 are operated according to the activated sludge method with aerobic sludge stabilization. The first plant in that area using sludge ashing preceding dewatering was recently put into operation. It serves a population of 300,000. Since natural sludge disposal will increasingly become more difficult for larger plants serving a population of 300,000 to 500,000 four more sludge ashing plants will go into operation shortly. Since sludge incineration is two or three times as expensive as digestion tanks, incinerators for this purpose will be built only if no other method can be applied. (Nave-FIRL)
W75-11747

PLANNING AND CONSTRUCTION OF SLUDGE TREATMENT PLANTS (PLANUNG UND BAU VON SCHLAMMBEHANDLUNGSANLAGEN),
W. Vater.
Technische Mitteilungen, Vol 68, No 5, p 181-185, May, 1975. 6 fig, 36 ref.

Descriptors: *Sludge treatment, *Waste disposal, *Sludge disposal, Legislation, *Waste water treatment, Water reuse, Incineration, Stabilization, Construction, Planning, *Treatment facilities.
Identifiers: Germany, Composting.

Treatment of sludge from communal waste water is planned to either convert the sludge into a useful form such as fertilizer or to complete hazard-free disposal. At the planning stage of such facilities, the Federal Waste Disposal Act (Germany), the Water Act and the Technical Directives for the Conservation of Clean Air (TA-Luft) must be taken into consideration. The advice of specialists is recommended. Any recycling or disposal of the sewage sludges must be preceded by a stabilizing process such as aerobic, anaerobic, aerobic-thermophilic stabilization, or by pasteurization, irradiation, or composting. Existing sludge disposal methods including composting, thermal drying, and incineration are reviewed. (Nave-FIRL)

W75-11748

COMPOSTING PLANT FOR REFUSE-SEWAGE SLUDGE IN THE DISTRICT OF GROSS-GERAU '&
'&
))(MUELL-KLAERSCHLAMM-KOMPOSTI'M SANLAGE FUER DEN KREIS GROSS-GERAU),
W. Kurney.
Aufbereitungs-Technik, Vol 16, No 5, p 219-225, May, 1975. 7 fig, 2 ref.

Descriptors: *Sewage treatment, *Waste water treatment, Biological treatment, Solid wastes, Microorganisms, Odors, Aeration, Organic compounds, Automation, *Treatment facilities.
Identifiers: Composting, Vacuum-pressure, Rotting process, Germany.

A composting plant for a mixture of refuse and sewage was designed. The facility is automated and incorporates transport systems which meet environmental protection requirements. Biological treatment is accomplished with the vacuum-pressure impulse method. Material is heaped onto a rotating plate and a vacuum is produced in the groove so that air is drawn through the trash/sewage sludge mixture, yielding a high percentage of oxygen to the microorganisms. Odors are carried to a compost filter where odorous substances adhere to the filter material and are decomposed by microorganisms. Waste gases leaving the compost filter are free of unwanted odors. Through the supply of oxygen, mesophile and later thermophile bacteria develop, raising the temperature within three days to about 60 or 70 C. This temperature can be maintained through aeration until all organically decomposable substances are used up; end products are sifted and either used in agriculture or dumped. (Nave-FIRL)
W75-11749

PASTEURIZATION OF SAPROPEL (PASTEURISIERUNG VON FAULSCHLAMM),
C. K. Soerensen.
Gas-und Wasserfach-Wasser/Abwasser, Vol 116, No 5, p 222-224, May, 1975. 1 fig, 2 tab, 2 ref.

Descriptors: *Sludge treatment, *Waste water treatment, *Aerobic treatment, *Anaerobic treatment, Chemical oxygen demand, Bacteria, E. coli.
Identifiers: *Pasteurization, *Sapropel.

Pasteurization experiments with sludge remaining from waste water purification were carried out in spiral heat exchangers. Pasteurization for five minutes at 80 C eliminated all salmonellae and the indicator bacterium Escherichia coli. A determination of the total germ number at 37C under aerobic and anaerobic conditions revealed no relationship between the intensity of the pasteurization effect and the pasteurization temperature. This may be explained by the varying content of bacterial spores in the digested sludge . In the experiments, a reduction in the germ number from 65 to 85 percent has been achieved. The increase of the COD in the sludge water doubled at pasteurization between 75 and 85 C and rose to nine-fold at pasteurization temperatures between 90 and 95 C. The steam consumption of the experiments was 47 kg steam/cu m sludge at a throughput of 15 cu m sludge/hr. (Nave-FIRL)
W75-11750

DOMESTIC SEWAGE TREATMENT BY UNDERDRAINED FILTER SYSTEMS,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
N. A. Chowdhry.
Publication No 53, December, 1974. 93 p, 37 tab, 11 ref, 3 append.

Descriptors: *Waste water treatment, *Filtration, *Septic tanks, Tile drains, Phosphorus, Ammonia, Biochemical oxygen demand, Suspended solids, [illegible]rms, *Sewage treatment, *Filters.
Identifiers: Underdrained sand filters, Red mud.

Tests conducted for 3 1/2 years demonstrated the effectiveness of underdrained sand filters as alternatives to conventional tile fields for treating septic tank effluent. The commonly available sands from gravel pits used as the filter media ranged from 0.15 mm to 2.50 mm effective size and 1.0 to 4.5 uniformity coefficient. The filter beds produced effluents with BOD5 equal to or less than 7.8 mg/liter and suspended solids equal to or less than 4.6 mg/liter. The efficiency of treatment was 96.5%. Phosphorus removal by the filter media without chemical additives was 26.3-36.2%. The filter bed containing red mud, a by-product of Bauxite purification containing oxides of calcium, aluminum, and iron, removed 72.5-88.9% of the phosphorus. A period of six months was required for the stabilization of nitrogeneous compounds and the satisfactory reduction in free ammonia. Fecal coliforms were not totally removed but were considerably reduced when compared to septic tank effluent. (Orr-FIRL)
W75-11751

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTE WATER TREATMENT IN CHLOR-ALKALI PRODUCTION,
Houston Univ., Tex. Dept. of Quantitative Management Science.
F. D. Singleton, Jr., J. A. Calloway, and R. G. Thompson.
Water Resources Research, Vol 11, No 4, p 515-525, August 1975. 11 fig, 4 tab, 22 ref.

Descriptors: *Water pollution control, *Standards, *Effluents, *Waste water treatment, *Linear programming, Economics, *Evaluation, Chemical industry, Chlorine, Alkalis(Bases), Effects, Costs, Treatment facilities, Optimization, Design, Solid wastes, Waste disposal, Technology, Water policy, Marginal costs, *Water utilization, Operations research, Mathematical models, Equations, *Waste water treatment.
Identifiers: Water withdrawal, Cost minimization, Power process model.

Described is an economic evaluation of the effects of increasingly restrictive waste water effluent standards and higher costs of water withdrawals on resource use, solid waste discharges, production costs, effluent taxes, and water use in chlorine and caustic production. A large-capacity diaphragm cell process, a small mercury process, and a combination of these production methods (for plant expansion) are studied for large modern plants at the design stage. A linear programming model provides an analytical description of a chlor-alkali plant at the design stage and determines the least -cost combination of processes. Model solution (1) identifies an optimal process configuration consisting of the production facility, waste treatment plant, and process energy system which satisfies all constraints and resource limitations pertinent to the problem, (2) gives minimum-cost levels of operation for each production and treatment process, (3) indicates the marginal costs of any resource or effluent restrictions, and (4) gives the total optimal cost of chlor-alkali production, water use, and waste water treatment. The model describes the three alternative methods for producing chlor-alkali products. According to results, zero discharges of total solids in diaphragm cell plants increased production costs 5.6%; zero discharges of total solids in mercury cell plants increased production cost 12.1%. Zero-discharge restrictions of mercury may only be accomplished by use of diaphragm cells. Similar results were obtained for assumed Houston and Saginaw locations. (Bell-Cornell)
W75-11765

ON TAXATION AND FIRMS CHOICE OF WASTE WATER TREATMENT TECHNOLOGY,
Technical Univ. of Denmark, Lyngby.
For primary bibliographic entry see Field 5G.
W75-11767

WATER RESOURCES PLANNING IN URBAN AREAS,
Office of the Chief of Engineers (Army), Washington, D.C. Urban Studies Branch.
R. L. Fulton.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 101, No HY9, Proceedings paper No. 11571, p 1249-1255, September 1975. 1 ref.

Descriptors: *Water resources, *Planning, *Water pollution, *Sewage treatment, Legislation, State jurisdiction, Federal jurisdiction, Alternative planning, Projects, *Waste water treatment.
Identifiers: *Urban areas.

Congress authorized the U.S. Army Corps of Engineers to initiate an Urban Studies Program late in fiscal year 1972. This program provides a planning service conducted in coordination with local and state officials to address water resources problems in urban areas. The objective is to formulate alternative plans for solving the water resource problems which will aid in the solving of other urban problems. These studies, which take three to four years to complete, provide a General planning service with strong public involvement and participation by state and local interests and other Federal agencies. Traditional Corps projects resulting from the plans will be recommended to Congress for construction; wastewater treatment components will meet appropriate requirements of the Federal Water Pollution Control Act of 1972 and be utilized by local interests in applying for construction grants administered by the EPA. (Bell-Cornell)
W75-11769

A DESIGN AND ECONOMIC EVALUATION OF WET-AIR AND CATALYTIC OXIDATION OF SEWAGE SLUDGE,
Delaware Univ., Newark. Dept. of Chemical Engineering.
A. G. Fishbeck.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 266, $4.25 in paper copy, $2.25 in microfiche. May 1974. 54 p, 16 fig, 6 tab, 19 ref, append. OWRT A-014-DEL(9).

Descriptors: *Sludge treatment, *Sludge disposal, Activated sludge, Organic wastes, Yeast, Kinetics, Costs, *Oxidation.
Identifiers: *Wet air catalytic oxidation, Solubilization kinetics.

A modification of the wet air oxidation process developed by Zimpro Incorporated is proposed. The wet air oxidation reactor is redesigned to solubilize 99% of the organic solids at a lower pressure and temperature. The resulting organic rich solution will then be passed through a heterogeneous catalytic reactor in which the organic compounds will be completely oxidized. The experimental determination of solubilization kinetics for sludge solids was performed using yeast as the sludge model because of its similarity to sludge and ease of handling. The solubilization of yeast was found to involve both rapid oxidation and slower hydrolysis reactions which followed first order kinetics in solids concentration. The rate became oxygen mass-transfer limited after the oxygen initially dissolved in the solution was consumed. The wet air catalytic oxidation process was economically similar to a typical wet air oxidation process, $4.10/ton solids processed and $3.87/ton, respectively. The wet air catalytic process achieves 99% removal of total organic carbon while the wet air oxidation process achieves only 60-70% removal and requires more severe conditions. The final products of a wet air catalytic oxidation of sludge are sanitary, easily disposed of, do not require recycle, and are essentially pollution free. Future experiments in solubilization kinetics should be performed using activated sludge instead of yeast as the solid. (Orr-FIRL)
W75-11784

THICKENING OF UNWANTED SPENT LIME REJECTS,
D. R. Christensen, and R. W. Prettyman.
Water and Sewage Works, Vol 122, No 5, p 102-104, May, 1975. 6 fig, 2 tab, 3 ref.

Descriptors: *Waste water treatment, *Centrifugation, *Lime, *Sludge treatment, Dewatering, Design criteria, Treatment facilities, Maryland.
Identifiers: *Sludge thickening, Montgomery County(Md).

The Montgomery County Regional advanced waste treatment plant in Maryland is planning to treat its lime sludge by separating the unwanted materials (rejects) from the spent lime by centrifugation. The spent lime can be reused following recalcination. The rejects will be further settled in gravity thickeners before being pumped to dewatering equipment prior to final disposal. An investigation was conducted to obtain design data for the gravity thickening units. The tests were conducted with rejects from a centrifuge at the South Lake Tahoe advanced waste treatment plant in California. Rejects from the centrifuge are expected to enter the thickeners at 3% solids. A 24 hr detention time in a 6 ft depth at 4% solids should result in a solids loading rate of 15 lb/sf/day. Two 90 ft diameter rejects thickeners with a 10 ft side water depth are the preliminary design recommendations. This design will produce solids loading at a maximum flow of 16 lb/sf/day. (Orr-FIRL)
W75-11848

THE INFLUENCE OF PARTICLE SIZE ON OXIDATION OF TOTAL, SOLUBLE, AND PARTICULATE MUNICIPAL WASTEWATER COMPONENTS BY OZONE,
Southern Methodist Univ., Dallas, Tex.
J. J. McCarthy.
Available from University Microfilms Inc., Ann Arbor, Mich., 48106, Order No 75-11,452. PhD Thesis, 1974. 153 p.

Descriptors: *Waste water treatment, *Ozone, *Oxidation, *Municipal wastes, Solids, Oxygen demand.
Identifiers: Waste water fraction, Particulate matter.

Experimental data using ozone as a waste water treatment oxidizing agent are presented. Municipal waste water containing varying sizes of solids was ozonated in a quiescent settling column and an ozone contact chamber. The effect of ozone oxidation on particular waste water parameters was measured. Samples were separated into soluble and particulate fractions and the effects of ozone on each fraction were analyzed. Ozone tended to oxidize the particulate more than the soluble waste water fraction. The oxidation of the soluble waste water fraction is dependent upon the solids content of the waste water. With respect to waste water solids content and ozone consumption, the limitations of ozone in removing organic carbon, in acting as a disinfectant, and in satisfying oxygen demand were demonstrated. Solid particle size and distribution with increased settling time and ozone consumption were also discussed. (Prague-FIRL)
W75-11850

5E. Ultimate Disposal Of Wastes

LAND SPREADING EFFLUENT FROM A SECONDARY FACILITY,
General Electric Co., St. Petersburg, Fla. Environmental Health Div.
For primary bibliographic entry see Field 5D.
W75-11365

TREATMENT AND DISPOSAL OF ANODIZING EFFLUENTS, PART I,
Grand Sheet Metal Products Co., Melrose Park, Ill. Croname Div.
For primary bibliographic entry see Field 5D.
W75-11377

TREATMENT AND DISPOSAL OF ANODIZING EFFLUENTS, PART II,
Grand Sheet Metal Products Co., Melrose Park, Ill. Cronome Div.
For primary bibliographic entry see Field 5D.
W75-11378

VACUUM SYSTEM FOR SEWAGE DISCHARGE IN KREMPEL (DISTRICT OF DITHMARSCHEN)-EXPERIENCE WITH A NEW KIND OF SEWERAGE (VAKUUMENTWAESSERUNG KREMPEL/DITHMARSCHEN- ERFAHRUNG-SBERICHT UEBER EINE NEUARTIGE KANALISATION),
For primary bibliographic entry see Field 5D.
W75-11383

ENVIRONMENTAL CONSTRAINTS CHALLENGE DESIGNERS OF SHORELINE COMMUNITY NEAR KANSAS CITY, MISSOURI,
Larkin and Associates, Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W75-11392

PROPOSED STANDARDS: LAND DISPOSAL OF EFFLUENTS,
University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W75-11400

FINAL DISPOSAL OF MUNICIPAL SLUDGE IN SWEDEN,
National Swedish Environment Protection Board, Stockholm. Research Lab.
V. Tullander.
Journal Water Pollution Control Federation, Vol 47, No 4, p 688-695, April, 1975. 2 fig, 1 tab, 1 ref.

Descriptors: *Legislation, *Ultimate disposal, Municipal wastes, Waste disposal, Treatment facilities, Waste water treatment, Sludge disposal, Landfills, Storage, Fertilizers.
Identifiers: *Sweden, *Sludge handling, Agricultural disposal.

A summary is presented of the most recent legislation from the National Swedish Environmental Protection Board on final disposal of municipal sludge in that country. The responsibility for municipal sludge disposal is seen as resting with the individual waste water treatment plant manager. Sludge handling for final disposal is dependent upon the sludge quality, preliminary treatment, and available local disposal methods. The types of disposal recommended are deposition either at sludge disposal sites or at landfill, or deposition for soil enrichment and agricultural use. Methods such as drying, incineration, or composting, are considered to intermediate rather than ultimate disposal steps. Choice of storage site should be based on the assessment of ground conditions. Factors to be considered in developing a disposal system include the diversion of rain and surface water, the building of dike walls around the disposal site, the collection and disposal of sludge runoff, and the continued inspection of sites, with appropriate safety measures to be taken. Sludge for agricultural use may require a short term, intermediate storage site, which should be located where no leaching and subsequent pollution of local water supplies might occur. Digested sludge as a fertilizer must meet Swedish standards such as metal content and must be continuously controlled as to effluent quality and frequency of application. (Prague-FIRL)
W75-11403

BREAKTHROUGH IN SEWAGE TREATMENT--CASH, LAND, AND ENERGY SAVED.
For primary bibliographic entry see Field 5D.
W75-11413

A CASE OF SUBTERRANEAN WATER POLLUTION CAUSED BY THE PUBLIC REFUSE DISPOSAL GROUND, (IN JAPANESE),
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
For primary bibliographic entry see Field 5B.
W75-11432

INCINERATOR DEVICE AND A METHOD OF PROCESSING RESIDUALS IN WASTE WATER, LIQUEFIED SEWAGE AND SLUDGE,
Klein (Albert) KG, Niederfischbach (West Germany). (assignee).
For primary bibliographic entry see Field 5D.
W75-11440

SEWAGE DISPOSAL SYSTEM,
Babcock and Wilcox Co., New York. (assignee).
For primary bibliographic entry see Field 5D.
W75-11511

SEWAGE AND GARBAGE DISPOSAL.
For primary bibliographic entry see Field 5D.
W75-11514

DEVICE AND METHOD FOR CONDUCTING WASTE LIQUID FROM A RECEPTACLE TO A PNEUMATIC LIQUID DISPOSAL SYSTEM,
For primary bibliographic entry see Field 5D.
W75-11519

SEWAGE DISPOSAL PROCESS,
For primary bibliographic entry see Field 5D.
W75-11522

DISPOSAL OF SANDY PIPELINE DREDGE SPOILS BY END DUMPING,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W75-11566

SUBSURFACE WASTE INJECTION IN THE UNITED STATES: FIFTEEN CASE HISTORIES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 5D.
W75-11627

A TOPOGRAPHIC-HYDROGEOLOGIC MODEL FOR SOLID WASTE LANDFILL SITING,
Iowa State Univ., Ames. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W75-11644

OUTLINE OF TAGAWA SEWAGE PLANT IN UTSUNOMIYA CITY, (IN JAPANESE),
For primary bibliographic entry see Field 5D.
W75-11686

ENERGY-WASTEWATER TREATMENT AND SOLIDS DISPOSAL,
Playa Del Rey, Calif. Hyperion Treatment Plant.
For primary bibliographic entry see Field 5D.
W75-11697

RECYCLING OF INCINERATOR ASH,
For primary bibliographic entry see Field 5D.
W75-11714

SLUDGE HANDLING AND DISPOSAL SEMINAR, CONFERENCE PROCEEDINGS NO. 2.
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 5D.
W75-11715

OVERVIEW OF CANADIAN SLUDGE HANDLING AND LAND DISPOSAL PRACTICES AND RESEARCH,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 5D.
W75-11716

SLUDGE HANDLING AND DISPOSAL PRACTICES IN ENGLAND,
Agricultural Development Advisory Service, Leeds (England).
For primary bibliographic entry see Field 5D.
W75-11717

DISPOSAL OF CHEMICAL SEWAGE SLUDGES ON LAND AND THEIR EFFECTS ON PLANTS, LEACHATE AND SOIL SYSTEMS,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
V. K. Chawla, D. N. Bryant, and D. Liu.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 207-233, (1974). 8 fig, 11 tab, 14 ref.

Descriptors: *Sewage sludge, *Environmental effects, Land, Soils, Fertilizers, Plant growth, Leachate, Nitrogen, Phosphorus, Potassium, Nickel, Copper, Zinc, Aluminum, Groundwater, *Canada, *Sludge disposal, *Waste disposal.
Identifiers: Sludge-soil-plant system, Petroleum hydrocarbons.

In 1972 an extensive lysimeter study was undertaken at the Wastewater Technology Centre, Burlington, Ontario, to determine the long-term environmental effects of chemical sewage sludges on land. The soils were silt loam and loamy sand. The sludges were anaerobic digested lime treated sludge, and ferric chloride treated sludge. A commercial fertilizer was also used. Plants and leachates were collected and analyzed. The rate of sludge application determined the yield of the dry matter. With a high rate of iron and lime sludges on loamy sand, the yields were comparable to fertilizer. On silt loam the yields were higher than with the fertilizer addition. On both soils, alum sludge gave lower yields than iron sludge, lime sludge, or fertilizer. Plant growth retardation could occur from the low potassium, high zinc and aluminum content of the alum sludge. High concentrations of petroluem hydrocarbons in the alum sludge also caused some plant toxicity. The nitrogen, phosphorus, potassium, nickel, copper, and zinc concentrations in the plants related to the amount of sludge applied. The nitrogen level in the leachate did not pose a potential hazard to groundwater. During the one-year study period no apparent chemical changes in the soil were observed. (See also W75-11715) (Dean-FIRL)
W75-11721

DESIGN INFORMATION ON DEWATERING PROPERTIES OF WASTEWATER SLUDGES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-11722

ASPECTS OF INCINERATING CHEMICAL SLUDGES,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Center.
For primary bibliographic entry see Field 5D.
W75-11728

SLUDGE HANDLING AND DISPOSAL PRACTICES IN THE REGIONAL MUNICIPALITY OF NIAGARA,
Regional Municipality of Niagara, Niagara Falls (Ontario). Public Works Dept.
For primary bibliographic entry see Field 5D.
W75-11730

SLUDGE HANDLING AND DISPOSAL PRACTICES IN METROPOLITAN TORONTO,
For primary bibliographic entry see Field 5D.
W75-11731

TREATMENT AND DISPOSAL OF SLUDGE FROM MUNICIPAL WASTEWATER PLANTS IN THE UNITED STATES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-11735

EXPERIENCES WITH SLUDGE HANDLING IN TEXAS,
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 5D.
W75-11736

SLUDGES GENERATED IN PHOSPHATE REMOVAL PROCESSES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-11737

EPA EXPERIENCES IN OXYGEN-ACTIVATED SLUDGE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-11738

EXPERIENCE OF THE RUHRVERBAND WITH THE TREATMENT OF SEWAGE SLUDGE (ERFAHRUNGEN DES RUHRVERBANDES BEI DER KLAERSCHLAMMBEHANDLUNG),
For primary bibliographic entry see Field 5D.
W75-11747

PLANNING AND CONSTRUCTION OF SLUDGE TREATMENT PLANTS (PLANUNG UND BAU VON SCHLAMMBEHANDLUNGSANLAGEN),
For primary bibliographic entry see Field 5D.
W75-11748

A DESIGN AND ECONOMIC EVALUATION OF WET-AIR AND CATALYTIC OXIDATION OF SEWAGE SLUDGE,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W75-11784

5F. Water Treatment and Quality Alteration

GREEN SYSTEMS FOR WASTEWATER TREATMENT.
For primary bibliographic entry see Field 5D.
W75-11401

FIELD EXPERIENCE IN DISINFECTING WATER MAINS (IN RUSSIAN),
N. A. Zaznobova, and V. D. Nemchinov.
Gig Sanit. 5. p 97-98, 1974.

Descriptors: Water supply, Water quality, Water quality standards, *Water quality control, Chlorination, Water resources development, Water treatment.
Identifiers: Perm District, *USSR(RSFSR).

Measures taken in the city of Usol'e in the Perm district of the Russian SFSR (USSR) to improve the water quality in the old part of the city are described. The water did not meet the sanitary standards with respect to bacteriological indices. Intensified monitoring of the quality of water in the water mains, flushing the mains and subsequent chlorination had a favorable effect. The sanitary service of the city has made recommendations to improve the maintenance and operation of the city's water mains.--Copyright 1975, Biological Abstracts, Inc.
W75-11411

SANITARY AND HYGIENIC EVALUATION OF SEEPAGE WATERS OF STRUCTURES PROTECTING RESERVOIRS (IN RUSSIAN),
Gorkovskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5B.
W75-11412

WATER PROCESSING PLANT TO CONTROLLED ACIDITY LEVEL,
K. G. Zeidel.
U.S.S.R. Patent SU 420569. Issued March 25, 1975. Derwent Soviet Patents Report, Vol W, No 7, p 1, March 1975. 1 fig.

Descriptors: *Acidity, *Patents, *Water treatment, *Treatment facilities, *Control, Equipment, Measurement, Pipelines, Design, Waste water treatment.
Identifiers: *Water processing plant.

A water processing plant to control acidity level which utilizes the addition of a reagent maintaining the pH difference between treated and untreated water was patented. This water treatment plant consists of a bifurcated pipeline, in which a branch is adapted for injection of acid from a tank through its corresponding needle valve. Alkalinity and acidity of water in two branches are measured by detectors, connected to an electronic regulator and programmer. Signals are applied to a reversible regulator, acting through a servomotor on a valve. The design provides a stable value of the residual alkalinity of water in the outlet pipe. (Prague-FIRL)
W75-11421

APPARATUS FOR CLEANING LOOSE FILTERING MATERIAL IN SLOW WATER FILLED WATER SUPPLY FILTERS,
B. F. Volokh.
Canadian Patent 957, 288. Issued November 5, 1974. Patent Office Record, Vol 102, No 45, p 38, November, 1974.

Descriptors: *Patents, *Filters, *Water supply, Cleaning, Equipment, Filtration, Water treatment, Waste water treatment.
Identifiers: Washing, Filtering material, Water supply filters.

Equipment was patented for cleaning loose filtering material in slow water-filled water supply filters. The apparatus consists of: a washing chamber with an open bottom, placed upon the surface of a layer of filtering material to be cleaned in a water-filled filter; means for moving this washing chamber relative to the filtering material to be cleaned. A suction pipe evacuates dirty water from the washing chamber. The washing tubes and suction pipe are installed within the washing chamber. Means regulate the degree of buoyancy of the washing chamber which is afloat in the filter, by regulating the pressure of the washing chamber upon the surface of the filtering material layer. (Prague-FIRL)
W75-11436

FLOTATION AERATOR FOR AERATING AND MOVING WATER,
For primary bibliographic entry see Field 5D.
W75-11439

BIOLOGICAL AND CHEMICAL PURIFICATION PLANT.
For primary bibliographic entry see Field 5D.
W75-11660

THE CONTINUOUS MONITORING OF WATER QUALITY,
Clyde River Purification Board, Glasgow (Scotland).
For primary bibliographic entry see Field 5A.
W75-11667

BALANCING RESERVOIR--A KEY ELEMENT IN WATER SUPPLY PLAN,
Freese and Nichols, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W75-11687

IRON AND MANGANESE REMOVAL WITH OZONE, PART I,
R. R. Furgason, and R. O. Day.
Water and Sewage Works, Vol 122, No 6, p 42, 45-47, June, 1975. 2 fig.

Descriptors: *Water treatment, *Ozone, Potable water, *Iron, *Manganese, Ion exchange, Filtration, Idaho, *Oxidation.
Identifiers: Sequestering, Chemical oxidation, Gravity filtration, Pressure filtration, Contact filtration, Manganese greensand, Moscow(Ida).

A water treatment demonstration program performed in the Moscow, Idaho, municipal water system showed that ozone can be used to effectively and economically oxidize iron and manganese to an insoluble form that can be removed by filtration. The water supply of Moscow is supplemented at times of peak demand by several wells containing water with a high iron and manganese content. The high costs of developing new wells which would provide a higher quality water have prompted research into methods of iron and manganese removal. In addition to the tests on ozone treatment, ion exchange, sequestering, chemical oxidation and gravity filtration, chemical oxidation and pressure filtration, and contact filtration/manganese greensand processes were examined. Ion exchange was found to be unsatisfactory because of the high operating and maintenance costs and the high sodium residual introduced into the water. Sequestering would be an economical process but has problems connected with its operation such as a chance of exceeding the maximum phosphate level, the heating effect could render the sequestering agent unusable, the need for pH adjustment, and the doubt as to the ability of this method to remove manganese. Gravity filtration is unacceptable because of the high operational and maintenance costs and also the danger of high sodium residual levels. Pressure filtration is an economical and effective way to remove iron but to also remove manganese significantly increases the cost of this method. The costs of contact filtration substantially exceed those of pressure filtration, but this process will remove the manganese along with the iron. (Orr-FIRL)
W75-11693

INNOVATIVE WATER PLANT SLATED FOR NEW JERSEY,
Havens and Emerson Ltd., East Paterson, N.J.
P. W. Doe, and W. R. Inhoffer.
Water and Wastes Engineering, Vol 12, No 4, p 30-32, 66, April, 1975. 1 fig.

Descriptors: *Treatment facilities, *Water treatment, *Waste water treatment, Sludge disposal, Planning, Investigations, Automation, Dewatering, *New Jersey.
Identifiers: Passaic Valley(NJ), Filter backwash water, Alum sludge.

The Passaic Valley Water Commission's major treatment plant is located at Little Falls, New Jersey on the Passaic River and serves Paterson, Passaic, Clifton and eleven other north New Jersey communities. Improvements taking place at this plant will provide an innovative water treatment project which is one of the first in the country to include a comprehensive filter backwash water and alum sludge disposal scheme. These improvements are expected to be completed in the near future. Extensive investigation both on-site and in the laboratory into dewatering, off-site disposal, and on-site disposal went into the plans for this project. Four pumping stations, a chemical dosing system, a backwash water settling tank, a sludge thickening complex, and a sludge press house will make up the backwash water and sludge disposal facilities. Overflows have been provide in case of emergency. Some phases of the process will be completely automated. (DEAN-FIRL)
W75-11696

SEA WATER SOFTENING WITH THE LIME-MAGNESIUM CARBONATE (LMC) PROCESS,
Burns and Roe Construction Corp., Fountain Valley, Calif.
J. D. Mavis, and A. Checkovich.
Industrial and Engineering Chemistry, Process Design and Development, Vol 14, No 3, p 204-209, 1975. 4 fig, 3 tab, 10 ref.

Descriptors: *Sea water, *Water softening, Pilot plants, Distillation, Desalination, Evaporators, Lime, Water treatment, Magnesium carbonate.
Identifiers: *Lime-magnesium carbonate process, Calcining, Magnesium hydroxide production, Magnesium hydroxide carbination.

A pilot plant to remove 70% of the calcium from sea water using the lime-magnesium carbonate (LMC) process was tested and improved. The advantages of the LMC process are that it does not depend on the sale of byproducts for its economic use, and all materials produced in the process are recycled for use in some other part of the process. Nominal chemical makeup is required. The two feedstocks required are limestone and fuel oil - all other materials in the process are derived from these. The four basic operations involved are softening, calcining, magnesium hydroxide production, and magnesium hydroxide carbonation. A prototype LMC plant was operated at the San Diego Test Facility by the Office of Saline Water, Department of the Interior. The utility of the LMC process as a pre-treatment for high temperature distillation desalting plants was demonstrated. The Test Facility experiments confirmed that an evaporator can be operated at a maximum brine temperature of at least 335 F, and that an LMC plant could be designed to have a high on-stream factor. The LMC pre-treatment is estimated to cost 5.1 cents per 1000 gallons of treated water for a plant sized to supply a 50 mgd desalting plant. The process may be useful with desalting processes using feed water more saline than the oceans. (Murphy-FIRL)
W75-11699

UPRATING AND REDESIGN OF WATER TREATMENT PLANTS, PART II,
E. O. LaFontaine.
Water and Sewage Works, Vol 122, No 5, p 96-97, May, 1975. 1 fig.

Descriptors: *Water treatment, *Treatment facilities, *Water supply, Filters, Pumps, Automatic control, Water demand, Pipes, Valves.

Advanced engineering technology can be used to uprate many water plants to provide greatly increased output. Increased output can often be effected through the use of new and better chemicals together with improved operating techniques without the need for physical disruption of the plant or new construction. Pressure filters and gravity filters may be uprated with properly designed pre-treatment facilities and chemical application. Filters may be rebuilt and uprated at a relatively modest cost. When rebuilding filters it may be desirable to replace the filter bottoms or under drain systems. The backwash system generally does not have to be rebuilt to perform satisfactorily with a rebuilt filter if it has performed well in the past. The installation of improved jet wash or air scouring equipment should be considered in an uprating program. Proper automatic control over the application of chemicals, rate of flow, filter operation, pump operation and emergency facilities will improve plant efficiency and insure a higher plant capacity. Uprating a plant will mean an increase in water which in turn may necessitate installation of new pipes, valves, and high lift pumps. A diesel generator set for standby power provides a significant improvement in operational efficiency under emergency conditions. A large clear water storage facility will also increase the capacity by providing the capability for operation under various load conditions. (Orr-FIRL)
W75-11849

5G. Water Quality Control

SEPARATION OF EMULSIFIED OIL FROM WATER,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W75-11360

COUNTY COMBATS URBAN STORM WATER RUNOFF PROBLEMS,
Mecklengurg County, Engineer's Office, Charlotte, N.C.
E. K. Hoffman.
Public Works, Vol 106, No 5,p 92-93, May, 1975.

Descriptors: *Water management(Applied), *Storm runoff, *Urbanization, Flood control, Flood plains, Streams, Drainage, Storm water, *North Carolina.
Identifiers: Sediment control.

Storm water management is being planned in Mecklenburg County, North Carolina, after a study of the effects of urbanization on storm runoff. It was found that an increase in the amount of runoff caused by urbanized impervious areas, coupled with a reduction in lag time, increases peak discharges up to 2 1/2 times, and causes an increased frequency and extent of downstream flooding. To prevent further encroachment on the existing floodplain, a floodway ordinance was passed, restricting development along any stream with a drainage area of at least one square mile. A five-year drainage capital improvement program has also been developed for stream bank sloping and stabilization and for the control of channel widening. In addition, the planning includes erosion and sediment control to minimize stream degradation. (Prague-FIRL)
W75-11390

AN EQUITABLE SEWER USE CHARGE SYSTEM,
Gilbert Associates, Inc., Reading, Pa.
P. A. Podolick.
Public Works, Vol 106, No 5, p 91, 95, 136A, May, 1975. 1 tab.

Descriptors: *Federal Water Pollution Control Act, Costs, Sewers, Treatment facilities, Waste disposal, Biochemical oxygen demand, Suspended solids, *Pollution taxes(Charges).
Identifiers: *Sewer use charges, Sewer rentals, Effluent quality, Unit treatment costs.

As a result of the Federal Water Pollution Control Act Amendments of 1972, equitable sewer use charge systems are being developed and implemented. Traditional sewer rentals or charges were based on an 'economy of scale', whereby the more cubic feet of waste water a particular user discharged, the less per cubic foot he would pay. The PL 92-500 guidelines stipulate that all recipients of Federal funds must pay a base charge in proportion to their contribution to the total waste water loading of their treatment works. In addition to the base charge, an industrial waste surcharge will be applied to all users who discharge waste water with concentrations of BOD, suspended solids, and/or dissolved solids in excess of those of normal domestic sewage. The base user charge assumes that domestic users discharge waste water with similar characteristics, and is determined by computing the total operational and maintenance costs for the previous year and dividing this figure by the total volume of waste water treated that year, to yield a charge in dollars per cubic foot of waste water discharged. For non-domestic wastes, an industrial surcharge is based on the preliminary determination of actual cost of treatment on a unit cost basis for BOD, suspended solids, and dissolved solids. A formula for quarterly surcharge is then implemented, involving unit treatment costs and waste loadings for each parameter as applied to an individual system. The formula must be updated each year by determination of current unit treatment costs. (Prague-FIRL)
W75-11391

OPEN WATER PURIFICATION SYSTEM,
For primary bibliographic entry see Field 5D.
W75-11419

REGIONAL SEWERING AND GROUNDWATER QUALITY IN THE SOUTHERN SAN JOAQUIN VALLEY,
For primary bibliographic entry see Field 5D.
W75-11446

METHOD FOR COMBATTING POLLUTION USING A CHROMIUM COMPLEX,
Seppic, Paris(France). (assignee).
J. Martineau, and F-J. Biechler.
United States Patent 3,886, 070. Issued May 27, 1975. Official Gazette of the United States Patent Office, Vol 934, No 4, p 1593, May, 1975. 1 fig.

Descriptors: *Waste water treatment, *Water pollution control, *Oil wastes, *Oil-water interfaces, *Patents, *Separation techniques, Water pollution sources, Oil spills, Oil pollution, *Skimming.
Identifiers: *Oil-water separation.

A method for the control of water pollution by oily products has been patented. The method involves forming a paste of the oily products, which then floats on the surface of the water and is removed by skimming. The first step of the method is the preparation of a product comprising a chromium complex anchored to solid particles of a metallic aluminosilicate. The chromium comples is coordinated to an acyclic carboxylic acid having at least seven carbon atoms, by contacting about 5-20 parts by weight of solid particles of an aluminosilicate of less than 100 micron average particle size with one part by weight of an aqueous alcoholic solution containing from about 20-30% by weight of the coordinated chromium complex. The mixture is then heated to dryness at a temperature of 100-200 C. One to four parts by weight of the dried product are distributed over one part by weight of the oily product floating on the surface of the water. The oily product then forms a paste floating on the surface of the water. The last step is to remove the paste from the surface of the water by skimming. (Orr-FIRL)
W75-11506

EVALUATION OF THE QUALITY OF SURFACE WATER FOR DEVELOPING RECOMMENDATIONS OF NONSPECIFIC PROPHYLAXIS OF INTESTINAL INFECTIONS, (IN RUSSIAN),
Kuybyshevskii Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny (USSR).
For primary bibliographic entry see Field 5C.
W75-11512

APPARATUS FOR SEWER TREATMENT TO KILL THREE ROOTS AND OTHER ORGANIC GROWTH THEREWITHIN,
Airrigation Engineering Co., Inc. Carmel Valley, Calif. (assignee).
F. F. Horne.
United States Patent 3,880,176. Issued April 29, 1975. Official Gazette of the United States Patent Office, Vol 933, No 5, p 2038, April, 1975. 1 fig.

Descriptors: *Patents, *Sewerage, *Pipes, Organic compounds, Phytotoxicity, Liquid wastes, Pressure.

Root-infested sewer pipes may be treated with a newly patented apparatus. Its parts consist of: a sled with a low center of gravity having a bottom skid for engaging only the lower portion of a pipe; means for pulling the sled through a pipe; and, upwardly facing spray means for producing a diffuse and foam-inducing spray. The sled is open at its upper end and the spray means are mounted on the sled so that they can direct spray against the upper walls of the pipe. An aqueous mixture of liquid phytocidal fumigant and surfactant is thus sprayed under pressure to the upper portions of the sewer pipe so that undesired organic growths are eliminated. (Prague-FIRL)
W75-11513

THE ECOLOGY OF THE CUMBERLAND ISLAND NATIONAL SEASHORE CAMDEN COUNTY, GEORGIA,
Georgia Univ., Savannah. Marine Extension Center.
For primary bibliographic entry see Field 2L.
W75-11546

COASTAL ZONE LEGAL REFERENCES (SELECTED) 1975.
State Univ. of New York, Buffalo. Faculty of Law and Jurisprudence.
For primary bibliographic entry see Field 2L.
W75-11548

WETLANDS - RELATED LEGISLATION IN THE UNITED STATES,
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 6E.
W75-11550

LEGAL MEASURES CONCERNING MARINE POLLUTION.
North Carolina Univ., Chapel Hill. School of Law.
UNC SG 75-04, February 1975. Seymour W. Wurfel (Ed.). 80 p.

Descriptors: *Law of the Sea, *International law, *Water pollution control, Oceans, Chemical wastes, Water pollution, Technology, Water rights, Jurisdiction.
Identifiers: *Marine resources law, Marine environment, Enforcement.

The purpose of this UNC Sea Grant paper is to chronicle new concepts and developments in marine pollution control and progress in marine resources law. The articles herein were researched and written by students of International Law at the University of North Carolina during the 1974 fall semester. (NOAA)
W75-11551

DISPOSAL OF SANDY PIPELINE DREDGE SPOILS BY END DUMPING,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
W. L. Schroeder, and M. R. Pyles.
In: Proceedings, ASCE National Structural Engineering Convention, April 14-18, 1975, New Orleans. Reprint no. ORESU-R-75-004. 18 p, 13 fig, 1 tab, 6 ref.

Descriptors: *Dredging, Excavation, Mathematical models, Channel improvement, Disposal, *Waste disposal.
Identifiers: *Dredge spoiling, *End dumping, Ambient velocity patterns, Induced velocities, Settling velocity, *Pipeline dredge spoils, Channel maintenance, Open water disposal.

It has been shown that it is possible to predict, within limits, the fate of sandy spoils discharged from a pipeline dredge in water. The means of making these predictions is based on a simple representation of the actual physical conditions at the end of the pipeline. More refined predictions are possible if physical conditions can be more completely characterized. In light of the nature of a real spoiling operation, and the possibility of more closely controlling spoil dispersion therefrom, it is unlikely that further refinements are warranted. A model based on settling velocities and average currents in the receiving body, coupled with an empirical representation of the effects of the pipeline jet, appears to be satisfactory. (NOAA)
W75-11566

AN INVENTORY AND STUDY OF THE VERMILION BAY-ATCHAFALAYA BAY COMPLEX; AREA DESCRIPTION, BIOLOGY, HYDROLOGY AND CHEMISTRY, AND SEDIMENTOLOGY,
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
For primary bibliographic entry see Field 2L.
W75-11571

DEVELOPMENT OF SALINITY CONTROL TECHNOLOGY IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
G. V. Skogerboe, W. R. Walker, R. S. Bennet, and J. H. Taylor.
Presented at the 1974 Annual Meeting of the American Society of Agricultural Engineers, June 23-26, 1974. Stillwater, Oklahoma, Paper No 74-2031. 23 p, 8 fig, 5 ref.

Descriptors: *Saline soils, *Saline water, Salinity, Technology, Irrigation, Agriculture, *Colorado, Irrigation operation and management, Crop production.
Identifiers: *Grand Valley(Colo), *Salinity control.

Research recently undertaken will evaluate the effects of various irrigation water management practices on the chemical quality of subsurface return flows as well as crop yields. The results of this effort will allow predictions of chemical quality in the Colorado River when various salinity control measures are implemented. (Skogerboe-Colorado State)
W75-11585

THE CASCO BAY OIL SPILL: PROBLEMS OF CLEANUP AND DISPOSAL,
Environmental Protection Agency, Boston, Mass. Div. of Surveillance and Analysis.
C. L. Eidam, E. V. Fitzpatrick, and J. F. Conlon.
In: 1975 Conference on Prevention and Control of Oil Pollution Proceedings; American Petroleum Institute, EPA, and U.S. Coast Guard; p 217-221, March 1975. 8 fig, 4 ref.

Descriptors: *Oil pollution, Sources, *Oil spills, Treatment, *Methodology, *Sands, *Commercial shellfish, Water quality, Survival, Lobsters, Intertidal areas, Burning, Disposal, Environmental effects, *Maine.
Identifiers: *Seaweeds, *Cleanup techniques, Follow-up studies, Recolonization, Casco Bay(Maine).

The control and cleanup of a 422,000 liter no. 6 fuel oil spill which occurred in Casco Bay, Maine, on July 22, 1972, were discussed. A lack of locally available equipment, transportation, and the disposal of large amounts of oil-soaked debris presented unique problems. The development of priorities for cleanup proved critical because of commercial harvests of shellfish, lobsters, and intertidal seaweed, and recreational interests. The disposal of 7,646m to the 3rd power of oil-soaked seaweed and 3,440 m to the 3rd power of contaminated beach sand was a major obstacle. The damage resulting from the spill and the effectiveness of the cleanup were studied up to one year after the spill. The studies indicated that the cleanup techniques used resulted in more successful survival and/or recolonization of intertidal populations than in areas not cleaned. (Katz)
W75-11615

REHABILITATING OILED AQUATIC BIRDS,
International Bird Rescue Research Center, Berkeley, Calif.
D. C. Smith.
In: 1975 Conference on Prevention and Control of Oil Pollution Proceedings; American Petroleum Institute and U.S. Coast Guard; p 241-247, March 1975. 1 tab, 3 append, 84 ref.

Descriptors: *Aquatic animals, *Oil pollution, *Oil spills, *Birds, *Animal physiology, Treatment, Economics, Cleaning, History, Population, Environmental effects, Mortality, Research and development, Detergents.
Identifiers: *Rehabilitation, *Aquatic birds.

In the 1971 San Francisco oil spill, $900.00 was spent per successfully released bird, with 95% of the 4,686 treated birds dying in captivity. Through continuing research and development, those figures are improving. In 1973, the International Bird Rescue Research Center treated 523 oiled birds with a 41% survival rate at a cost of approximately $15 per successfully released bird. The history, population effects, and physiological effects of oil pollution on birds were described, and recommendations were given for treatment. The problems of maintaining aquatic birds in captivity were also discussed. Advance preparations of instructional materials, equipment, and supplies have been made in anticipation of future oiled-bird incidents. Additional research was indicated. (Katz)
W75-11616

THE STATUS OF OILED WILDLIFE: RESEARCH AND PLANNING,
American Petroleum Inst., Washington, D.C.
K. G. Hay.
In: 1975 Conference on Prevention and Control of Oil Pollution Proceedings; American Petroleum Institute, EPA and U.S. Coast Guard; p 249-253, March 1975. 23 ref.

Descriptors: *Oil pollution, Aquatic animals, *Oil spills, *Birds, Treatment, *Research and development, *Comprehensive planning, Mortality, Population, Assessments, Cleaning, Environmental effects.
Identifiers: Rehabilitation.

The efforts taken by organizations and individuals in recent years in the United States, Canada and Great Britain to improve the cleaning and rehabilitation of oiled wildlife, especially water fowl, were discussed. Biological problems were assessed. Research results were outlined. (Katz)
W75-11617

REVISION OF THE REGULATIONS 'PLANNING OF SANITARY PROTECTION ZONES OF A CENTRAL WATER SUPPLY SYSTEM AND WATER SOURCES' (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
S. N. Cherkinskii, and N. N. Trakhtman.
Gig Sanit, Vol 38, No 11, p 89-92. 1973.

Descriptors: Potable water, *Water quality control, *Regulation surface waters, Water pollution sources, *Water quality standards, *Water zoning, Water treatment, Bacteria.
Identifiers: Contamination, *USSR.

When revising the regulations on the planning of sanitary protection zones, the existing bacterial contamination of surface water sources, the known limitations of water treatment at water works, and the dependence of the end result of water treatment and decontamination on its initial quality must be considered. These factors necessitate the creation of sanitary protection zones of central drinking water systems to limit contamination of the water by bacteria, viruses and organic matter from domestic and industrial sewage. The boundaries of the protection zones of surface water sources should be based on the rate of bacterial self-purification and the climatic zone.--Copyright 1975, Biological Abstracts, Inc.
W75-11682

POLLUTION DETECTION AND RIVER QUALITY MANAGEMENT,
For primary bibliographic entry see Field 5A.
W75-11753

ON TAXATION AND FIRMS CHOICE OF WASTE WATER TREATMENT TECHNOLOGY,
Technical Univ. of Denmark, Lyngby.
M. Bundgaard-Nielsen, and C. L. Hwang.
Water Resources Bulletin, Vol 11, No 4, p 805-810, August 1975. 3 fig, 22 ref.

Descriptors: *Water quality control, *Waste water treatment, Technology, *Taxes, Effluents, *Pollution abatement, Management, Linear programming, Optimization, Economic efficiency, Equations, Systems analysis, *Pollution taxes(Charges).
Identifiers: Environmental quality, Consumer prices, Production costs, Waste discharge, Cost minimization.

In recent years, the use of effluent charges or taxation to abate pollution has been advocated extensively. A major argument in support of the taxation approaches is that they can achieve economic efficiency with minimum information requirements. Byrne and Spiro (1973) have demonstrated that taxation is a necessary condition but not a sufficient one for attainment of an efficient solution under certain circumstances when the firm has at its disposal a number of production processes where low levels of pollution require high capital input and vice versa. This paper extends the work of Byrne and SIRO AND PRESENTS A DISCUSSION of the interaction between the level of taxation and the firms accruing choice of treatment technology. Presented is a linear programming solution for the choice of least-cost waste treatment process. In conclusion, the interaction between available technology and enforcement strategy must be accounted for in order to prevent the use of taxation levels which fail to improve environmental quality yet tend to increase production costs and thus consumer prices. The possible inefficiency of a surcharge to abate pollution is similar to that of the taxation. (Bell-Cornell)
W75-11767

HYGIENIC EVALUATION OF SPRING CAPPINGS USED ON THE SOUTHERN SHORE OF CRIMEA, (IN RUSSIAN),
Yalta Sanitary-Epidemiology Station (USSR).
Y. E. Shapiro.
Gig Sanit, Vol 38, No 11, p 99-101, 1973.

Descriptors: *Water quality control, *Spring waters, Water sources, Potable water, Public health.
Identifiers: *Cappings, *USSR(Crimea).

A study of the structures for collecting spring water used on the water mains of Crimea (USSR) showed that hygienic requirements are met only by spring cappings of the Smulskii type, which has upland drainage ditches, puddle trenches of well-crumbled and tamped fat clay, a side entrance door and a settling basin serving as the water-collecting chamber. The construction of these cappings helps to preserve the quality of spring water and their proper operation reduces the possibility of water pollution at the site of intake.--Copyright 1975, Biological Abstracts, Inc.
W75-11793

ENVIRONMENTAL ASPECTS OF AQUATIC PLANT CONTROL,
Bureau of Reclamation, Denver, Colo. Div. of Research.
T. R. Bartley, and E. O. Gangstad.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 100, No IR3, p 231-244, September, 1974. 4 fig, 2 tab, 17 ref.

Descriptors: *Aquatic environment, Aquatic life, Aquatic plants, *Aquatic weed control, Aquatic weeds, *Herbicides, Environmental effects.

Detailed studies on the environmental aspects of aquatic control with aquatic herbicides do not preclude their use when properly selected and properly applied. Residues in the water under the conditions stated, do not preclude the use of this water for irrigation of crop plants or potable use of the water. (Skogerboe-Colorado State)
W75-11843

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

PROCEDURE FOR SELECTING A MINIMAL ENVIRONMENTAL IMPACT ROUTING FOR A WATER CONVEYANCE CANAL,
Texas Tech Univ., Lubbock. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W75-11764

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTE WATER TREATMENT IN CHLOR-ALKALI PRODUCTION,
Houston Univ., Tex. Dept. of Quantitative Management Science.
For primary bibliographic entry see Field 5D.
W75-11765

LAND USE AND ENVIRONMENTAL PLANNING: AN APPLICATION IN THE SOUTH CAROLINA COASTAL ZONE,
Battelle-Columbus Labs., Ohio.
For primary bibliographic entry see Field 6G.
W75-11766

DETERMINING OPTIMAL WELL DISCHARGE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4B.
W75-11768

DEVELOPMENT PLANNING OF LAGUNA DE BAY--PHILIPPINES,
Laguna Lake Development Authority, Manila (Philippines).
For primary bibliographic entry see Field 4A.
W75-11770

COOPERATION IN WATER RESOURCES PROGRAMS: ALASKA'S EXAMPLE,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
For primary bibliographic entry see Field 6B.
W75-11775

IDENTIFICATION OF PARAMETERS IN A LINEAR EQUATION OF GROUNDWATER FLOW,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W75-11799

HYDROLOGIC ASPECTS OF WATER HARVESTING IN THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2A.
W75-11811

6B. Evaluation Process

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS. ECONOMIC, LEGAL AND FINANCIAL ASPECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg, L. H. Botham, L. Rice, W. J. Shoemaker, and L. S. Tucker.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 877, $7.50 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No 65, July 1975. 220 p, 19 fig, 31 tab, 5 append. OWRT B-113-COLO(8), 14-31-0001-5059.

Descriptors: Benefits, Budgeting, Cities, Drainage, Drainage practices, *Drainage programs, *Economic justification, Feasibility, Financial feasibility, Flood plains, *Project benefits, Runoff, *Storm drains, *Cost-benefit analysis, Colorado, *Urban drainage, Financing, Evaluation, Flood control, Coordination, Legislation, Regulation, Land use.
Identifiers: Drainage law.

Techniques for evaluating minor and major Urban Drainage and Flood Control (UDFC) Projects are described. Economic, political, engineering, financial and legal problems must be faced prior to implementation of proper levels of these projects. The measurement of tangible benefits is described while a literature review revealed no direct objective techniques for quantifying intangibles. Some methods for establishing the relative rankings of intangible contributions show promise for improvement of evaluation techniques, however. The legal problem of establishing benefits is described and a copy of recently enacted Colorado legislation is included. Information on the estimation of flood damages and the selection of discount rates is presented for use by the analyst. Careful coordination of land use and drainage control measures is stressed. Related recent legislation and regulations are included.
W75-11352

COST BENEFIT ANALYSIS AS DIMENSIONING BASIS OF FLOOD CONTROL MEASURES: AN EMPIRICAL REPORT (NUTZEN-KOSTEN-ANALYSE ALS GRUNDLAGE DER DIMENSIONIERUNG VON HW-SCHUTZMASSNAHMEN- EIN ERFAHRUNGSBERICHT),
P. Schreiber.
Wasser und Boden, Vol 27, No 2, p 27-29, February 1975. 2 fig, 3 ref.

Descriptors: *Computers, *Flood control, Hydrologic aspects, Reservoirs, Economics, *Cost-benefit analysis, Simulation, Flood protection.
Identifiers: West Germany.

Computerized cost-benefit analysis as a basis for the dimensioning of flood protection measures involving 40 retention reservoirs in the Aller-Leine-Oker-Planes area, covering 16,000 sq km in West Germany, is discussed. The hydrological data are determined on the basis of simulation with respect to a limited number of flood events. The flood retention facilities will be designed for a probability of exceeding 0.02. The economic benefits of the flood control measures are calculated with respect to the potential damage areas classed as residential, industrial, commercial, farmlands, and forests. Averaged unit damages are assigned to each type of land use, taking into consideration the increase in landed property values as a result of flood protection. It is possible to determine the optimal sequence of the flood protection measures by the computer program. Flood retention reservoirs along the upper reaches of the recipients are most efficient even when they are more expensive than similar facilities along the lower reaches of the recipients. (Takacs-FIRL)
W75-11415

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W75-11500

WETLANDS - RELATED LEGISLATION IN THE UNITED STATES,
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 6E.
W75-11550

NATURAL AND ARTIFICIAL REEFS IN MISSISSIPPI COASTAL WATERS: SPORT FISHING PRESSURE AND ECONOMIC CONSIDERATIONS,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
Donnie L. Daniel, and Joe E. Seward, Jr.
Report MASGP-75-007, Spring 1975. 27 p, 1 fig, 3 tab. OSG MASGP-75-007.

Descriptors: *Reefs, *Sport fishing, *Economic feasibility, Resources, Econometrics, Cost-benefit analysis, Fisheries, Economics, Data collections, Surveys, *Mississippi.
Identifiers: *Mississippi Sound, Economic analysis, Natural reefs, Artificial reefs.

This study represents the initial research effort in an attempt to assess the sport fishing pressure at existing artificial and natural reefs in the Mississippi Sound. Activities are already underway to develop new artificial fishing reefs in that area. Hopefully, this study will provide some useful input toward an efficient utilization of scarce resources for that purpose. The purpose of this project is twofold: (1) it provides estimates of the fishing pressure on various types of artificial and natural fishing reefs in the Mississippi Sound; and (2) it provides some economic guidelines which should prove useful in determining the feasibility of artificial reefs. The study also makes recommendations that are designed to help achieve the conditions necessary for the reef to be economically justified. (NOAA)
W75-11558

THE COASTS OF WISCONSIN,
Wisconsin Univ., Madison. Sea Grant Program.
For primary bibliographic entry see Field 2H.
W75-11569

HURRICANE EXPERIENCE LEVELS OF COASTAL COUNTY POPULATIONS - TEXAS TO MAINE,
National Weather Service, Fort Worth, Tex.
For primary bibliographic entry see Field 2B.
W75-11570

COASTAL RESOURCE USE: DECISIONS ON PUGET SOUND,
Washington Univ., Seattle.
R. L. Bish.
University of Washington Press Seattle, 1975, 217 p. OSG 1-35320, NG-1-72, and 04-3 158-42; NSF GH-40 and GH-66.

Descriptors: *Resources development, *Coasts, *Natural resources, Water utilization, Fisheries, Forestry, Boating, Economics, Political aspects, Geological formations, Urban sociology, Regional analysis, *Washington.
Identifiers: *Puget Sound(WA), *Coastal resources, Legal-political system, Shoreline Management Act of 1972.

Five scholars in economics, political science, geography, and urban affairs study Puget Sound for coastal resource use patterns, trends and conflicts, and the legal and political structures through which resource use decisions are made. The volume begins with a historical description of the Puget Sound region, including its geological formations, its resources, and their role in the region's development. These patterns are related to specific uses of Puget Sound's resources, from fisheries and forestry to pleasure boating and shoreline parks. Conflicts among different resource uses are analyzed, with four in-depth case studies illustrating the nature of the conflicts and how the legal-political system functions to revolve them. The origins, controversies, and predicted consequences of Washington's landmark Shoreline Management Act of 1972 are also analyzed. Of particular interest are the original aspects of this study: the systematic analysis of conflict resolution has been integrated with the nature of the resources involved, and the forecasts of uses and conflicts have been integrated with a political analysis. (NOAA)
W75-11573

AGRICULTURAL DRAINAGE RESEARCH NEEDS AND PRIORITIES, 1974,
Agricultural Research Service, Baton Rouge, La.
For primary bibliographic entry see Field 4A.
W75-11632

COOPERATION IN WATER RESOURCES PROGRAMS: ALASKA'S EXAMPLE,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
C. W. Slaughter, T. G. Freeman, and G. L. Audsley.
Water Resources Bulletin, Vol 10, No 4, p 802-812, August 1974. 5 fig, 2 tab, 9 ref.

Descriptors: *Water resources development, *Alaska, *Programs, Coordination, Hydrology, Planning, River basins, Snow surveys, Networks, Assessment, Watersheds(Basins).
Identifiers: Flood warning.

Alaska possesses a diversity and magnitude of water resources unmatched in any other state. With over 15% of the total area of the United States and 40% of the nation's total fresh water supply, but with an extreme lack of basic hydrologic and climatologic data, cooperation among agencies and individuals concerned with evaluating, planning, and implementing water

resources programs is essential. Toward this end, the IntereAgency Technical Committee for Alaska (IATCA) was established under charter from the Water Resources Council. Representation in IATCA includes virtually all Federal, State, and Academic entities in Alaska having an interest in the water resources of the State. Existence of IATCA has permitted or facilitated numerous Alaskan water resources programs. Several are described briefly: a flood warning network in the Chena River basin; establishment of the Caribou-Poker Creeks Research Watershed in Central Alaska; preparation and periodic updating of the 'Ten-Year Plan for Water Resources Data Acquisition;' current planning for an integrated 'real-time reporting network' for hydrometeorological data within the State; and a framework for implementation of the Alaska phase of the National Water Resources Assessment, currently in the initial phases. Accomplishments to date testify that it is indeed possible to cooperate and amalgamate in the broad field of 'Water Resources' in the largest of our 50 states. (Bell-Cornell)
W75-11775

PLANNING FOR RESOURCES-ENVIRONMENTAL CONSERVATION,
R. F. Bessey.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY11, Proceedings paper No 10173, p 2061-2078, November 1973. 40 ref.

Descriptors: *Water resources, Civil engineering, *Environmental engineering, *Conservation, *Management, *Natural resources, *Regional planning, *Comprehensive planning, River basins, Multiple-purpose, Cost-benefit ratio, Evaluation.
Identifiers: *Systems engineering, Drainage basins, Environmental quality.

The need is stressed for comprehensive, integrated, resources-environmental planning in our present era of mounting endangerment of the human environment. The focus is on background and trend in water, land, and related resources, and regional planning. The human purposes and consequences of goals, policies, plans, design, and programs in resources-environment fields are implicit. The present place and potential of civil engineering (inherently concerned with the problems of citizen and civilization) in this scene of environmental threat are substantial. The burgeoning requirement for environmental impact reviews substantially expands the need and opportunity for civil engineering participation. However, the overall philosophy and organization of comprehensive planning must be interdisciplinary, with application of the gamut of concerned physical, social, and administrative sciences and arts. Analysis includes general views of: (1) the evolutionary setting, with emphasis on conservation, river basins, and regions; (2) situation and directions of planning in the present era; (3) comprehensive planning requirements, purposes, and principles; (4) organizational arrangements; (5) global aspects; and (6) salient conclusions as to civil engineering directions and practices.
W75-11781

AN ECONOMIC AND ENVIRONMENTAL RECONNAISSANCE OF THE POSSIBILITIES FOR SMALL WATERSHED DEVELOPMENT IN CHENANGO COUNTY,
Jones (Barclay) and Associates, Ithaca, N.Y.
For primary bibliographic entry see Field 4D.
W75-11796

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

AN EQUITABLE SEWER USE CHARGE SYSTEM,
Gilbert Associates, Inc., Reading, Pa.
For primary bibliographic entry see Field 5G.
W75-11391

SUFFICIENT WATER SUPPLY AND SEWER SYSTEM, AND EQUITABLE DISTRIBUTION OF THE COSTS (TILLSTREKKELIGE VANN- OG KOLAKKANLEGG-SAMT RETTFERDIG FORDELING AV KOSTNADENE),
For primary bibliographic entry see Field 5D.
W75-11393

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W75-11500

NATURAL AND ARTIFICIAL REEFS IN MISSISSIPPI COASTAL WATERS: SPORT FISHING PRESSURE AND ECONOMIC CONSIDERATIONS,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
For primary bibliographic entry see Field 6B.
W75-11558

ANALYSIS OF INTERNATIONAL GREAT LAKES SHIPPING AND HINTERLAND,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
M. Balfe, R. Heilmann, J. Johnson, and W. Wendling.
Special Report No 23, April 1975, 395 p.

Descriptors: *Great Lakes, *Great Lakes region, *Economics, Export, Import, Transportation, Foreign trade.
Identifiers: *Shipping, *Trade, *Commodity analysis, Port analysis, Trade routes, Chicago, Cleveland, Detroit, Duluth, Milwaukee, Toledo, Export movements, Import movements, Shipments.

This study is concerned with both a geographic and commodity-specific description of the hinterland of the Great Lakes. Using as a source report a sampling survey of export and import traffic entitled Domestic and International Transportation of U.S. Foreign Trade: 1970, issued by the Bureau of Census, the authors sought to obtain new data on the domestic leg of U.S. foreign trade and to link those with previously collected information on the international leg of 'linear-type' commodity flow. Detailed analyses constitute the bulk of the report, including specific analyses of 28 commodities and major Great Lakes ports. It is stressed that the source material was biased toward shipment weight for vessel movements and therefore the inadequacy of the sampling procedure should be taken into consideration before specific conclusions are to be drawn. (NOAA)
W75-11576

ON TAXATION AND FIRMS CHOICE OF WASTE WATER TREATMENT TECHNOLOGY,
Technical Univ. of Denmark, Lyngby.
For primary bibliographic entry see Field 5G.
W75-11767

AN ECONOMIC AND ENVIRONMENTAL RECONNAISSANCE OF THE POSSIBILITIES FOR SMALL WATERSHED DEVELOPMENT IN CHENANGO COUNTY,
Jones (Barclay) and Associates, Ithaca, N.Y.
For primary bibliographic entry see Field 4D.
W75-11796

6D. Water Demand

HYDROLOGY FOR LAND-USE PLANNING: THE HILLSIDE AREA, ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W75-11504

FORECASTING URBAN WATER USE: COMMERCIAL ESTABLISHMENTS,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, R. C. Sutherland, and J. R. Kim.
Journal of the American Water Works Association, Vol 65, No 5, p 239-244, May, 1975. 4 tab, 7 ref.

Descriptors: *Water demand, *Water distribution(Applied), *Water users, *Planning, *Forecasting, Elasticity of demand, Water requirements, Water supply, Consumptive use, Human population.
Identifiers: *Commercial establishments, Mall shops.

Water demand prediction equations are derived from a study of water use in four shopping centers. Commercial establishment water use has not been extensively studied because it accounts for only 15 to 20% of total water demand and lacks the large daily and seasonal peaks of industrial and residential use. But accurate demand predictions are necessary where limits are placed on water and sewer hookups. Department stores with and without restaurants and 24 types of mall shops were analyzed. Geographic differences are minimal because water is used primarily for domestic-type uses: water for air conditioning was not included in the study. Use depends on staff size and also the number of public facilities found in large stores. A close linear relationship was found using gross floor area as a proxy variable which is much easier to determine and more readily available. There is also significant variation between types of mall shops since some use water in their business activities. Classification of shops by 4-digit S.I.C. (Standard Industrial Classification) code allows more accurate demand predictions by shop type. Forecasting must also consider layout and design, transportation balance, labor productivity, and the common variables of regulations and technological change. The inelastic demand with respect to price in domestic-type water use suggests that commercial use, which includes considerable lavotory use, will not respond significantly to changes in water price. (Herr-North Carolina)
W75-11795

6E. Water Law and Institutions

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS. ECONOMIC, LEGAL AND FINANCIAL ASPECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W75-11352

FINAL DISPOSAL OF MUNICIPAL SLUDGE IN SWEDEN,
National Swedish Environment Protection Board, Stockholm. Research Lab.
For primary bibliographic entry see Field 5E.
W75-11403

COASTAL ZONE LEGAL REFERENCES (SELECTED) 1975.
State Univ. of New York, Buffalo. Faculty of Law and Jurisprudence.
For primary bibliographic entry see Field 2L.
W75-11548

WETLANDS - RELATED LEGISLATION IN THE UNITED STATES,
Miami Univ., Fla. School of Law.
D. A. Crowley, J. G. MacDonald, and G. P. Settles.
Report FY75-4, December 1974, 56 p. UMSG R/L-5.

Descriptors: *Water law, *Wetlands, *Legislation, Aquatic environment, Common law, Administration, Governments, Legal aspects, Permits, Planning, Regulation, Zoning, Water permits, Water rights, Administrative decisions, Judicial decisions, Law enforcement, Water, Water policy, Administrative agencies, Estuaries.

This article deals with the protection of wetlands by law. It focuses on the benefits and purposes of wetlands and the effects of alterations on the wetland's natural state. Specifically, it deals with the pattern of state regulation of wetlands and the differences in regulations from state to state. The article also contains an appendix where state laws, definitions, prohibited acts and/or authorizations, administrative schemes, and standards for use and development of wetlands are given. (NOAA)
W75-11550

LEGAL MEASURES CONCERNING MARINE POLLUTION.
North Carolina Univ., Chapel Hill. School of Law.
For primary bibliographic entry see Field 5G.
W75-11551

A FEDERAL PLAN FOR NATURAL DISASTER WARNING AND PREPAREDNESS, FIRST SUPPLEMENT FY 1976 - 1980.
National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 2B.
W75-11553

PROCEEDINGS OF ALABAMA COASTAL LEADERS CONFERENCE ON COASTAL ZONE MANAGEMENT.
Alabama Development Office, Montgomery. State Planning Div.
Report MASGP-75-012, April 30, 1975. 71 p.

Descriptors: *Conferences, *Water law, *Zoning, Documentation, Public rights, Coasts, Legal aspects, *Alabama.
Identifiers: *Coastal zone management, Alabama coast, Mobile(AL).

The Alabama Coastal Leaders Conference on Coastal Zone Management was held in Mobile, Alabama, on April 30, 1975. This conference was attended by more than 250 concerned citizens and representatives. It was the second in a series of meetings on coastal zone management scheduled for the current fiscal year. This conference was designed to help inform the public on the subject of coastal zone management and to obtain suggestions and support for maintaining public involvement. It introduces a future workshop series, where coastal leaders will be encouraged to make recommendations for specific provisional policy goals and policy development. (NOAA)
W75-11555

STATE REGULATION OF COASTAL WATER AREA PRESERVES,
Miami Univ., Fla. School of Law.
C. Hatfield.
Project No. R/L-5, December 1974. 60 p. Project No. R/L-5.

Descriptors: *Water management(Applied), *Water conservation, *Water control, Coasts, *Sea water, Estuaries, Water rights, Marine fisheries, Conservation, Water policy, River regulation, *Regulation, *Preservation, Protection, State jurisdiction.
Identifiers: Coastal waters, Marine sanctuaries, *Estuarine sanctuaries, *Sanctuaries, State regulations, Coastal zones, Coastal regulations, Coastal management, State policies.

Each sanctuary should have a stated management program which would be consistent with both the goals of the particular sanctuary and with federal procedures. The program should clearly specify the controlling functions of the sanctuary, the means of accomplishing the stated purposes and the mechanisms for managing the sanctuary. Provisions should be made for the approval of projects and programs as well as for termination of them and for resolution of conflicts and for modifications of the uses of the sanctuary. Any proposed environmental modification in the vicinity of the sanctuary should be critically reviewed by responsible local, state and federal agencies and should be prohibited if it has an adverse effect on the sanctuaries. The boundaries of each sanctuary should be clearly marked and the region should be properly policed to insure that the guidelines governing sanctuary operations are not violated. (NOAA)
W75-11568

THE MANAGEMENT OF LAND AND WATER USE IN THE COASTAL ZONE: A NEW LAW IS ENACTED IN NORTH CAROLINA,
North Carolina Univ., Chapel Hill. School of Law.
T. J. Schoenbaum.
Reprint from The North Carolina Law Review, Vol 53, December 1974, No 2. University of North Carolina Sea Grant Reprint No 77, 30 p. OSG GH 103.

Descriptors: *North Carolina, *Water law, *Water policy, *Regulation, *Coasts, *Comprehensive planning, *Management, Legislation, Law enforcement, Legal aspects, Penalties(Legal), Water rights, Water, Zoning, Land use, Land development, Land management, Governments, Judicial decisions, Watershed management, Project planning.
Identifiers: *Coastal Area Management Act(CAMA) of 1974(NC), Federal Coastal Zone Management Act of 1972, Coastal zone management.

This article analyses and evaluates the Coastal Area Management Act of 1974, North Carolina in light of the Federal Coastal Zone Management Act of 1972 and other comprehensive state coastal zone management laws. It also describes the significant new legal processes instituted and discusses some of the new legal questions raised. The act itself was a first step toward the establishment of a comprehensive coastal land and water management program. No definitive judgment of its effectiveness can be made until after it is fully implemented. The author feels that even through the Act meets the minimum federal guidelines for a state coastal zone management program it contains serious flaws that may subvert its effective operation. These include the exclusively local character of the Coastal Resources Council, the lack of legal requirements to assure the implementation of the planning process, and the exemptions given to certain interest groups, especially agriculture and forestry. The author feels continuing empirical research on the law's operation and effectiveness are needed. (NOAA)
W75-11575

ROLE OF COMPUTER SIMULATION IN ADMINISTERING AN URBAN DRAINAGE ORDINANCE,
Hydrocomp, Inc., Palo Alto, Calif.
T. N. Debo, and A. M. Lumb.
Simulation Network Newsletter, Vol 7, No 2, p 1-8, February 15, 1975. 6 ref.

Descriptors: *Computer models, *Legislation, *Drainage, *Cities, Floods, Storm runoff, Hydrologic aspects, Administration, *Simulation analysis.
Identifiers: Hydrologic simulation.

A computer-simulated model urban drainage ordinance based on problems, ordinances, and experiences of urban areas was drafted. Emphasis was placed on the interaction between the technical and non-technical aspects of practical drainage problems. Contacts were made with over thirty cities and counties throughout the United States to determine which areas had relevant experience, whether they would participate in the study, and whether they felt they could benefit from results of such a study. Five areas were chosen. The drainage program of each area was intensively investigated and data were compiled into case studies. Some provisions of the model ordinance which was then drafted could pose administrative and engineering problems during implementation, which could be better handled with the help of modelling. Hydrologic computer simulation is a technical tool that may be used with minimal training by engineers of local governments and consulting firms to evaluate the effects of developments, drainage problems, and potential solutions. Once calibrated for a region, a model can be used throughout that area to get a consistent and more accurate approach for evaluating flood and drainage problems. For example, on-site storage facilities are often used in urban areas for controlling storm runoff. However, analysis of their synergistic effects is necessary to prevent potential flood peaks--a problem rapidly solved by computer simulation. Hydrologic simulation results in lower error, greater forecasting capability, enhanced ability to analyze interactive drainage characteristics, and requirements of different areas.
W75-11669

REVISION OF THE REGULATIONS 'PLANNING OF SANITARY PROTECTION ZONES OF A CENTRAL WATER SUPPLY SYSTEM AND WATER SOURCES' (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
For primary bibliographic entry see Field 5G.
W75-11682

WATER RESOURCES PLANNING IN URBAN AREAS,
Office of the Chief of Engineers (Army), Washington, D.C. Urban Studies Branch.
For primary bibliographic entry see Field 5D.
W75-11769

6F. Nonstructural Alternatives

COST BENEFIT ANALYSIS AS DIMENSIONING BASIS OF FLOOD CONTROL MEASURES: AN EMPIRICAL REPORT (NUTZEN-KOSTEN-ANALYSE ALS GRUNDLAGE DER DIMENSIONIERUNG VON HW-SCHUTZMASSNAHMEN- EIN ERFAHRUNGSBERICHT),
For primary bibliographic entry see Field 6B.
W75-11415

ROLE OF COMPUTER SIMULATION IN ADMINISTERING AN URBAN DRAINAGE ORDINANCE,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6E.
W75-11669

FLOOD PLAIN INFORMATION: LEY CREEK, SALINA AND DEWITT TOWNSHIPS, ONONDAGA COUNTY, NEW YORK.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11785

FLOOD PLAIN INFORMATION: FLOOD HAZARD REPORT OF 4-7 JULY 1969 FLOOD, HURON RIVER, NORWALK CREEK, OHIO.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11787

FLOOD PLAIN INFORMATION: PLUM CREEK, BRUNSWICK HILLS AND MEDINA TOWNSHIPS, MEDINA COUNTY, OHIO.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11788

FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W75-11789

FLOOD PLAIN INFORMATION: VENTURA RIVER, VENTURA COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-11790

FLOOD PLAIN INFORMATION: CONTRARY CREEK, ST. JOSEPH, MISSOURI.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W75-11791

FLOOD PLAIN INFORMATION: CHITTENANGO CREEK, BRIDGEPORT, ONONDAGA AND MADISON COUNTIES, NEW YORK.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11792

6G. Ecologic Impact Of Water Development

THE ECOLOGY OF THE CUMBERLAND ISLAND NATIONAL SEASHORE CAMDEN COUNTY, GEORGIA,
Georgia Univ., Savannah. Marine Extension Center.
For primary bibliographic entry see Field 2L.
W75-11546

AN ECOLOGICAL SURVEY OF THE ROCKY COAST ADJACENT TO A BROMINE EXTRACTION WORKS,
Natural Environment Research Council, Anglesey (Wales). Unit of Marine Invertebrate Biology; and University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5C.
W75-11758

PROCEDURE FOR SELECTING A MINIMAL ENVIRONMENTAL IMPACT ROUTING FOR A WATER CONVEYANCE CANAL,
Texas Tech Univ., Lubbock. Dept. of Civil Engineering.
D. M. Wells, J. D. Mertes, B. L. Allen, and A. N. Glick.
Water Resources Bulletin, American Water Resources Association, Vol 11, No 4, p 714-733, August 1975. 12 fig, 1 tab, 4 ref.

Descriptors: *Environmental effects, *Comprehensive planning, *Water resources development, Water conveyance, Canals, Routing, Assessment, Coasts, Evaluation, Water supply, Texas, Multiple-purpose projects, Computers.
Identifiers: Environmental corridor selection, Linear corridor selection, Interdisciplinary analysis, *Environmental impact analysis, *Overlay mapping, *Computer graphics, Value ratings.

Several techniques for selecting a least environmental impact corridor have been proposed. Two approaches have been found workable: computer graphics and overlay mapping. This report combines features of both approaches to determine an appropriate routing for a water conveyance canal. The evaluation study was conducted by an interdisciplinary planning team. Environmental factors were mapped and weighted on overlay maps. Alternative routes were identified and carefully studied. Several critical environmental implications were noted. Aesthetic factors, outdoor recreation interpretation, visitor safety and disruption of human and animal travel routes were considered. Evaluation of an environmental analysis procedure requires close examination of the project objectives, scope, and ultimate decision making body that will ultimately utilize the findings. Size and scale of project play important roles when examining cost figures. The overlay map procedure provides an effective graphic media through which the process of selecting and evaluating alternative linear corridors can be presented. The importance of an interdisciplinary planning team cannot be stressed enough. (Bell-Cornell)
W75-11764

LAND USE AND ENVIRONMENTAL PLANNING: AN APPLICATION IN THE SOUTH CAROLINA COASTAL ZONE,
Battelle-Columbus Labs., Ohio.
G. Nehman, G. Boles, N. Dee, and J. Griffin.
Water Resources Bulletin, American Water Resources Association, Vol 11, No 4, p 759-769, August 1975. 4 tab, 2 ref.

Descriptors: *Land use, *Land development, *Environment, *Planning, *Coasts, *South Carolina, Regulation, Economics, Social aspects, Methodology, Compatibility, Data collections, Constraints, Model studies, Evaluation, Maps, Systems analysis.
Identifiers: *Beaufort County(SC), Map overlays, Suitability analysis.

Considered is Beaufort County, South Carolina's approach to dealing with the problem of land use controls. A rural, highly polarized coastal community, Beaufort County opted to set regulations for controlling its development in the face of conflicting interests. An analysis tool with economic, environmental, and social conditions as criteria for setting regulations was developed; described is the Land Use Trade-Off Model (LUTOM) and its application to Beaufort County. The model was used to define locations best suited for each size and type of desired land use within the region, to define policies which were constraints to development, and to analyze the compatibility between adjacent land uses. Map overlays were used for analyzing and aggregating the economic, environmental, and social data. Various land use categories were evaluated using a numerical scoring system, and the scores were then used to assist in developing the land use regulations. In conclusion, LUTOM provides a workable analysis tool with analytical and reproducible output that can be used for land use planning and control; it yields a rationale for setting regulations, the mechanism for which lies with the local county council and related groups. Despite its successful use in a rural community, however, it would probably need to be computerized to deal with complex urban systems. LUTOM is most useful in defining broad policy issues; it can also be used to rate alternative sites for a particular development proposal. (Bell-Cornell)
W75-11766

MAN ON THE HYDROLOGIC CYCLE,
Annamalai Univ., Annamalainagar (India).
For primary bibliographic entry see Field 2A.
W75-11776

PLANNING FOR RESOURCES-ENVIRONMENTAL CONSERVATION,
For primary bibliographic entry see Field 6B.
W75-11781

7. RESOURCES DATA

7A. Network Design

COMPARATIVE ANALYSIS OF ESTIMATION METHODS IN NONLINEAR FUNCTIONAL MODELS OF THE RAINFALL-RUNOFF PROCESS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2A.
W75-11354

IMPROVED APPLICATION OF GEOPHYSICS TO GROUNDWATER RESOURCE INVENTORIES IN GLACIATED TERRAINS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W75-11355

THE RAINFALL RECORDER PROBLEM,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-11448

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W75-11500

7B. Data Acquisition

APPARATUS FOR PROVIDING A STATISTICAL COUNT OF PARTICULATE MATERIAL IN A FLUID,
Protron Associates, Palo Alto, Calif. (assignee).
For primary bibliographic entry see Field 5A.
W75-11434

A METHOD OF INVESTIGATING POPULATIONS OF DIATOMS IN FLOWING WATERS, (IN GERMAN),
For primary bibliographic entry see Field 2I.
W75-11445

COMPARISON OF PRECIPITATION GAGE CATCHES WITH A MODIFIED ALTER AND A RIGID ALTER TYPE WINDSHIELD,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2B.
W75-11457

PHYSICOCHEMICAL PROPERTIES OF DREDGE SPOIL,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11465

A SATELLITE CLASSIFICATION TECHNIQUE FOR SUBTROPICAL CYCLONES,
National Weather Service, Fort Worth, Tex. Southern Region.
For primary bibliographic entry see Field 2B.
W75-11562

CURRENT MEASUREMENTS USING A TILTING SPAR,
Scripps Institution of Oceanography, La Jolla, Calif.
R. L. Lowe, D. L. Inman, and C. D. Winant.
Reprint from the Proceedings of the 14th Coastal Engineering Conference, Copenhagen, Denmark, June 1974, p 225-239, Chapter II. 6 fig, 1 tab, 4 ref. Published by American Society of Civil Engineers.

Descriptors: *Ocean currents, *Instrumentation, *Model studies, *Current meters, Ocean waves, Computer models, Water circulation, Oceanography, Frequency, Data processing.
Identifiers: *Tilting spar, Shelf and Shore System, *Current measurements, Wave direction, Oscillators, Oscillatory flow.

The dynamic response of the spar to oscillatory flow has been examined by modeling as well as computer analysis of the non-linear differential equation. Field measurements using the tilting spar have been made. These measurements are compared with theory and with other more direct measurements of the wave field. The tilting spar has been used to estimate wave direction. These estimates generally agree well with directional estimates made using a pressure sensor array and a two-component current meter. (NOAA)
W75-11564

TRACING OCEAN CURRENTS,
Washington Univ., Seattle. Sea Grant Advisory Service.
For primary bibliographic entry see Field 2E.
W75-11574

TROPICAL CYCLONE INTENSITY ANALYSIS AND FORECASTING FROM SATELLITE IMAGERY,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2B.
W75-11577

FIELD TEST OF SOIL WATER FLUX METERS,
Agricultural Research Service, Riverside Calif. Salinity Lab.
For primary bibliographic entry see Field 2G.
W75-11586

SAMPLING TOOL FOR TAKING UNDISTURBED SOIL CORES,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 2G.
W75-11599

CELLULAR SNOW GENERATION--A DOPPLER RADAR STUDY,
Chicago Univ., Ill. Lab. for Atmospheric Probing.
For primary bibliographic entry see Field 2B.
W75-11634

7C. Evaluation, Processing and Publication

THE USE OF COMPUTERS FOR FORECASTING THE SANITARY SYSTEMS OF WATER BODIES (PRIMENENIYE EVM DLYA PROGNOZIROVANIYA SANITARNOGO SOSTOYANIYA VODOYEMOV),
For primary bibliographic entry see Field 5D.
W75-11410

SOLUTION OF A FREE-SURFACE BOUNDARY VALUE PROBLEM USING AN INVERSE FORMULATION AND THE FINITE ELEMENT METHOD,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W75-11447

THE RAINFALL RECORDER PROBLEM,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-11448

TRANSPORT MODEL, USER'S MANUAL,
Battelle-Pacific Northwest Labs., Richland, Wash. Water and Land Resources Dept.
For primary bibliographic entry see Field 5B.
W75-11468

VARIABLE THICKNESS TRANSIENT GROUNDWATER FLOW MODEL USER'S MANUAL,
Battelle-Pacific Northwest Labs., Richland, Wash. Systems Dept.
For primary bibliographic entry see Field 2F.
W75-11469

WATER QUALITY REPORT: THE COLUMBIA RIVER BELOW LONGVIEW, WASHINGTON, DECEMBER 1971 - NOVEMBER 1972,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5B.
W75-11472

HYDROGEOLOGY OF THE WAINWRIGHT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W75-11475

GENERATION OF HYDROLOGIC SAMPLES: CASE STUDY OF THE GREAT LAKES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W75-11476

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 1. NORTH ATLANTIC SLOPE BASINS.
Geological Survey, Reston, Va.
Available from Sup of Documents, GPO, Washington, DC 20402 $5.55 (paper copy). Water-Supply Paper 2151, 1975. 674 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, *Northeast US, River basins, Basic data collections, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, District of Columbia, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites, Surface waters.
Identifiers: *North Atlantic slop basins.

During the water year ending September 30, 1970, the Geological Survey maintained 238 stations on 139 streams in the North Atlantic slope basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 183 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 72 and daily at 28 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 36 stations during the year ending September 30, 1970. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 17 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11479

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $5.45 (paper copy). Water-Supply Paper 2152, 1974. 668 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Sediment transport, *Water temperature, *Streams, *Southeast US River basins, Atlantic Ocean, *Gulf of Mexico, Basic data collections, Chemical analysis, Physical properties, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *South Atlantic Slope basins, *Eastern Gulf of Mexico basins.

During the water year ending September 30, 1970, the Geological Survey maintained 180 stations on 119 streams in the South Atlantic Slope and Eastern Gulf of Mexico basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 161 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 33 and daily at 53 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 6 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 1 station. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11480

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $2.10 post-paid $1.75 GPO Bookstore. Water-Supply Paper 2093, 1973. 309 p, 1 fig, 39 ref.

Descriptors: *Water quality, *Sediment transport, *Water temperature, *Ohio River, Alabama, Illinois, Indiana, Kentucky, Maryland, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Basic data collections, Streamflow, Chemical analysis, Physical properties, Inorganic compounds, Biological properties, Sampling, Sites.
Identifiers: *Ohio River basin.

During the water year ending September 30, 1968, the Geological Survey maintained 141 stations on 92 streams for the study of chemical and physical characteristics of surface water in the Ohio River Basin. Samples were collected daily and monthly at 75 of these locations for chemical-quality stu-

dies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 67 and daily at 42 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 21 stations during the year ending September 30, 1968. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were not determined. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11481

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 6. MISSOURI RIVER BASIN.
Geological Survey, Reston, Va.
Water-Supply Paper 2145, 1974. 441 p, 1 fig, 40 ref.

Descriptors: *Water quality, *Sediment transport, *Water temperature, *Missouri River, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wyoming, Basic data collections, Chemical analysis, Physical properties, Particle size, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *Missouri River basin.

During the water year ending September 30, 1969, the Geological Survey maintained 212 stations on 110 streams for the study of chemical and physical characteristics of surface water in the Missouri River basin. Samples were collected daily and monthly at 177 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 35 and daily at 77 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 40 stations during the year ending September 30, 1969. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 44 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11482

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 7. LOWER MISSISSIPPI RIVER BASIN.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 Price $5.25. Water-Supply Paper 2156, 1975. 636 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, *Mississippi River basin, Basic data collections, Arkansas, Colorado, Kansas, Kentucky, Louisiana, Mississippi, Missouri, New Mexico, Oklahoma, Texas, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *Lower Mississippi River basin.

During the water year ending September 30, 1970, the Geological Survey maintained 289 stations on 167 streams in the Lower Mississippi River basin for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 274 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 17 and daily at 82 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 15 stations during the year ending September 30, 1970. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 15 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11483

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART 8. WESTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 Price $3.45 - paper cover. Water-Supply Paper 2097, 1974. 473 p, 1 fig, 39 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, *Gulf of Mexico, River basins, Basic data collections, Colorado, Louisiana, New Mexico, Texas, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *Gulf of Mexico basins(Western).

During the water year ending September 30, 1968, the Geological Survey maintained 157 stations on 88 streams in the Western Gulf of Mexico basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 153 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 1 and daily at 102 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 26 stations during the year ending September 30, 1968. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 26 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11484

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $3.60 (paper copy). Water-Supply Paper 2159, 1974. 397 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Sediment transport, *Water temperature, *Streams, *California, River basins, Basic data collections, Chemical analysis, Physical properties, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *Pacific Slope basins(Calif).

During the water year ending September 30, 1970, the U.S. Geological Survey maintained 184 stations on 124 streams of the study of chemical and physical chacteristics of surface water in the Pacific Slope basins in Calif. Samples were collected daily and monthly at 74 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 111 and daily at 27 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 77 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 48 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W75-11485

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 6. MISSOURI RIVER BASIN--VOLUME 3, MISSOURI RIVER BASIN FROM SIOUX CITY, IOWA, TO NEBRASKA CITY, NEBRASKA.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $3.45 postpaid $3.00 GPO Bookstore. Water-Supply Paper 2118, 1973. 710 p, 1 fig.

Descriptors: *Basic data collections, *Streamflow, *Flow rates, *Missouri River, Iowa, Minnesota, Wyoming, Colorado, Nebraska, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: *Missouri River basin, Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Missouri River basin from Sioux City, Iowa, to Nebraska City, Nebr. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum and minimum discharges. (Woodard-USGS)
W75-11486

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 8. WESTERN GULF OF MEXICO BASINS--VOLUME 2. BASINS FROM LAVACA RIVER TO RIO GRANDE.
Geological Survey, Reston, Va.

Available from Supt of Documents, GPO, Washington, DC 20402 $5.70 (paper copy). Water-Supply Paper 2123, 1974. 861 p, 1 fig.

Descriptors: *Basic data collections, *Surface waters, *Streamflow, *Flow rates, River basins, Gulf of Mexico, Colorado, New Mexico, Texas, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: *Western Gulf of Mexico basins, Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Western Gulf of Mexico basins, Lavaca River to Rio Grande. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W75-11487

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 9. COLORADO RIVER BASIN--VOLUME 3. LOWER COLORADO RIVER BASIN.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 Price $5.55. Water-Supply Paper 2126, 1975. 681 p, 2 fig.

Descriptors: *Basic data collections, *Streamflow, *Flow rates, *Colorado River basin, Arizona, California, Nevada, New Mexico, Utah, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Lower Colorado River basin. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W75-11488

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 10. THE GREAT BASIN.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $7.35 (paper copy). Water-Supply Paper 2127, 1974. 1143 p, 1 fig.

Descriptors: *Basic data collections, *Streamflow, *Flow rates, *Great Basin, California, Idaho, Nevada, Oregon, Utah, Wyoming, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations of the Great Basin in California, Idaho, Nevada, Oregon, Utah, and Wyoming. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W75-11489

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON--VOLUME 1. PACIFIC SLOPE BASINS IN WASHINGTON EXCEPT COLUMBIA RIVER BASIN.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $4.40 (paper copy). Water-Supply Paper 2132, 1974. 640 p, 1 fig.

Descriptors: *Basic data collections, *Streamflow, *Flow rates, *Surface waters, *Washington, River basins, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: *Pacific slope basins(Wash), Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Pacific slope basins in Washington except Columbia River basin. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W75-11490

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 13. SNAKE RIVER BASIN.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Washington, DC 20402 $5.50 (paper cover). Water-Supply Paper 2134, 1974. 821 p, 1 fig.

Descriptors: *Basic data collection, *Surface waters, *Streamflow, *Flow rates, River basins, Idaho, Nevada, Oregon, Utah, Washington, Wyoming, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: *Snake River basin, Maximum discharges, Minimum discharges.

This report in one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Snake River Basin. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W75-11491

SELENIUM IN WATERS IN AND ADJACENT TO THE KENDRICK PROJECT, NATRONA COUNTY, WYOMING,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-11492

GEOHYDROLOGIC RECONNAISSANCE OF THE UPPER POTOMAC RIVER BASIN,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-11493

GROUND-WATER DATA FOR BOLIVAR COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
G. J. Dalsin, and B. E. Wasson.
Mississippi Board of Water Commissioners, Jackson, County Report No 1, 1975. 55 p, 7 fig, 1 plate.

Descriptors: *Groundwater resources, *Basic data collections, *Hydrologic data, *Water quality, *Mississippi, Water wells, Well data, Water levels, Aquifer characteristics, Water utilization, Water yield, Chemical analysis.
Identifiers: *Bolivar County(Miss), Sand intervals.

Ground-water basic data in Bolivar County, Miss., are presented in 4 tables and 8 illustrations. Almost 2,000 wells are described and located. Chemical analyses, and intervals on electric logs, and the geologic section are tabulated. The occurrence of groundwater in Bolivar County is illustrated by geohydrologic sections and an aquifer thickness map. Examples of water-levels changes in wells are shown. (Woodard-USGS)
W75-11496

GROUND-WATER DATA IN THE HARRISBURG - HALSEY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,
Geological Survey, Portland, Oreg.
F. J. Frank, and N. A. Johnson.
Oregon State Engineer, (Salem), Ground Water Report No 22, 1975. 48 p, 3 fig, 1 plate, 3 tab, 14 ref.

Descriptors: *Groundwater resources, *Basic data collections, *Water yield, *Water quality, *Oregon, Well data, Drillers logs, Water levels, Aquifer characteristics, Water utilization, Chemical analysis, Hydrographs.
Identifiers: *Central Willamette Valley(Oreg), *Harrisburg - Halsey area(Oreg).

The Harrisburg-Halsey area covers about 350 square miles in the central Willamette Valley, Oreg., and is part of a broad alluvial plain that lies between the Cascade and Coast Ranges in the central part of the Willamette Valley. Most of the data for the 506 wells in this report were obtained from well drillers' reports. Chemical analyses of water from 36 wells are tabulated. Most of the high-yield wells in the area produce water from alluvial (sand and gravel) aquifers that underlie the valley plain or that are coextensive with the present flood plain of the Willamette River. The water table in the alluvial aquifer is generally only a few feet below land surface. Pumping lifts are relatively small, and wells produce moderate to large quantities of groundwater of good chemical quality. (Woodard-USGS)
W75-11498

GROUND-WATER LEVELS IN LOUISIANA--FOR WELLS MEASURED THROUGH 1974.
Geological Survey, Baton Rouge, La.
Louisiana Department of Public Works, Baton Rouge, Water Resources Basic Records Report No 7, 1975. 548 p, 57 fig, 54 tab, 6 ref.

Descriptors: *Water wells, *Water levels, *Well data, *Louisiana, *Data collections, Aquifers, Observation wells, Hydrologic data, Groundwater.

This report includes data for the entire period of record for 599 wells in 54 parishes in Louisiana. The assemblage of water-level records has been divided into two parts--'currently measured wells' and 'formerly measured wells.' Currently measured wells are observation wells that are included in the current network and were measured during the period 1971-74. Water levels for current wells are included for the entire period of record. Formerly measured wells are observation wells in which measurements were discontinued prior to 1971. Records for these wells will be published in a subsequent report. The observation-well program in Louisiana was established in 1939. (Woodard-USGS)
W75-11499

A BIBLIOGRAPHY OF BISCAYNE BAY, FLORIDA MONITORING AND RESEARCH PROGRAMS,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 10C.
W75-11557

STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF NORTH CAROLINA, SOUTH OF CAPE LOOKOUT,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2B.
W75-11560

STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF PUERTO RICO,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2A.
W75-11561

SOURCES OF WATER QUALITY, LAKE LEVEL, ICE, WATER TEMPERATURE AND METEOROLOGICAL DATA FOR THE ST. LAWRENCE GREAT LAKES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W75-11567

AN INVENTORY AND STUDY OF THE VERMILION BAY-ATCHAFALAYA BAY COMPLEX; AREA DESCRIPTION, BIOLOGY, HYDROLOGY AND CHEMISTRY, AND SEDIMENTOLOGY,
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
For primary bibliographic entry see Field 2L.
W75-11571

CENTRAL NORTH PACIFIC TROPICAL CYCLONES, 1974,
Fleet Weather Central FPO San Francisco, 96630.
For primary bibliographic entry see Field 2B.
W75-11579

SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W75-11590

MERCER COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 4A.
W75-11622

VERMILION COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 4A.
W75-11623

LAWRENCE COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 4A.
W75-11624

DE KALB COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 4A.
W75-11625

EVAPORATION DATA IN TEXAS,
Texas Water Development Board, Austin.
J. P. Dougherty.
Report 192, June 1975. 237 p, 6 fig, 122 tab.

Descriptors: *Evaporation, *Texas, Stations, *Evaporation pans, Federal government, State governments, Local governments, Data collections, Administrative agencies, Cities, Atmometers, *Data collections.
Identifiers: *Evaporation data, *Evaporation stations, Local interests, Bureau of Plant Industry pan, National Weather Service pan, Young screen pan.

Available historical pan-evaporation data obtained in Texas, spanning a 64-year period from January 1907 to December 1970, were presented. Data gathered from 114 evaporation stations in operation in Texas during some part of the period were compiled. Most evaporation measurements were made with three types of pans: the Bureau of Plant Industry pan, the National Weather Service pan, and the Young screen pan. Several other pan types and the evaporometer have been utilized in Texas, but the volume of record obtained with these was small compared to that from the three main types of evaporation pans. The measuring devices were described completely, with photographs of installations and plans and specifications. The bulk of the report consisted of 122 data charts. It was mentioned that because of wind and other conditions, pan evaporation was not applicable to bodies of water unless proper numerical coefficients, typically between 0.6 and 1.2 for areas in Texas, are applied to the data. (Roberts-ISWS)
W75-11630

HYMO FLOOD ROUTING,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 4A.
W75-11647

ROLE OF COMPUTER SIMULATION IN ADMINISTERING AN URBAN DRAINAGE ORDINANCE,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6E.
W75-11669

PROCEDURE FOR SELECTING A MINIMAL ENVIRONMENTAL IMPACT ROUTING FOR A WATER CONVEYANCE CANAL,
Texas Tech Univ., Lubbock. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W75-11764

FLOOD PLAIN INFORMATION: LEY CREEK, SALINA AND DEWITT TOWNSHIPS, ONONDAGA COUNTY, NEW YORK.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11785

FLOOD PLAIN INFORMATION: FLOOD HAZARD REPORT OF 4-7 JULY 1969 FLOOD, HURON RIVER, NORWALK CREEK, OHIO.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11787

FLOOD PLAIN INFORMATION: PLUM CREEK, BRUNSWICK HILLS AND MEDINA TOWNSHIPS, MEDINA COUNTY, OHIO.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11788

FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W75-11789

FLOOD PLAIN INFORMATION: VENTURA RIVER, VENTURA COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-11790

FLOOD PLAIN INFORMATION: CONTRARY CREEK, ST. JOSEPH, MISSOURI.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W75-11791

FLOOD PLAIN INFORMATION: CHITTENANGO CREEK, BRIDGEPORT, ONONDAGA AND MADISON COUNTIES, NEW YORK.
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 4A.
W75-11792

IDENTIFICATION OF PARAMETERS IN A LINEAR EQUATION OF GROUNDWATER FLOW,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W75-11799

DESERT STRIP FARMING--COMPUTER SIMULATION OF AN ANCIENT WATER HARVESTING TECHNIQUE,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3B.
W75-11812

A COMPUTER MODEL FOR OPTIMIZING DESIGN OF IMPROVED CATCHMENT,
Western Australia Dept. of Agriculture, Moora. Soil Conservation Service.
For primary bibliographic entry see Field 3B.
W75-11813

8. ENGINEERING WORKS

8A. Structures

LARGE DIAMETER SUBMARINE STEEL PIPELINE CROSSINGS,
Greater Vancouver Sewage and Drainage District. (British Columbia).

D. Mackay.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 71-92, 24 fig.

Descriptors: *Pipelines, *Pipes, *Sewerage, Water conveyance, Distribution systems, Steel pipes.
Identifiers: *Submarine pipeline crossings.

The Greater Vancouver area of British Columbia presents many engineering problems for the bulk transportation of water and sewage. To solve these problems, numerous summarine pipelins crossings have been installed at various sewage and water districts. To minimize the cost of the river crossings, new methods for assembling the units on land and pulling them into a dredged trench were devised. Innovative techniques have been developed for the installation of pipelines in large, fast moving alluvial rivers. The main features of the design and construction of six steel pipe submarine crossings are discussed. Some of the unique design features and new construction techniques for the installation of these large diameter steel submarine construction techniques for the installation of these large diameter steel submarine conduits include: a circular profile system which places no limit on the size and weight of conduit that can be installed as long as the circular profile can be achieved by open cut; the flectural bending of large diameter steei pipes to a degree of curvature greater than that previously used; and the launching of large diameter multiple steel pipes in a single package from timber skids on shore. The circular profile system is particularly useful where the launching space is restricted and the diameter of the pipe precludes the use of flectural bending. In the crossings described, the radii of curvature for 48, 54, and 66 inch pipe have been limited to 2400, 3000, and 4000 feet, respectively. (Orr-FIRL)
W75-11380

SANITARY AND HYGIENIC EVALUATION OF SEEPAGE WATERS OF STRUCTURES PROTECTING RESERVOIRS (IN RUSSIAN),
Gorkovskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5B.
W75-11412

HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
For primary bibliographic entry see Field 8B.
W75-11466

HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT, COFFERDAM TESTS,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
For primary bibliographic entry see Field 8B.
W75-11467

PREDICTIVE MODELING OF EFFECTS OF THE PLANNED KINDRED LAKE ON GROUNDWATER LEVELS AND DISCHARGE, SOUTHEASTERN NORTH DAKOTA,
Geological Survey, Bismarck, N.Dak.
For primary bibliographic entry see Field 4A.
W75-11503

OPEN CUT METHOD USED FOR MAJOR SEWER.
For primary bibliographic entry see Field 5D.
W75-11618

PROVIDING SUBURBAN SEWERAGE DESPITE ENVIRONMENTAL AND CONSTRUCTION PROBLEMS,
Minnetonka Public Works, Minn.
For primary bibliographic entry see Field 5D.
W75-11657

CENTER PIVOT DESIGN CAPACITIES IN EASTERN COLORADO,
Agricultural Research Service, Fort Collins, Colo.
D. F. Heermann, H. H. Shull, and R. H. Mickelson.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 100, No IR2, p 127-141, June, 1974. 9 fig, 3 tab, 15 ref.

Descriptors: *Sprinkler irrigation, *Irrigation design, Irrigation engineering, Irrigation practices, Irrigation systems, Flow rates, Design flow, *Colorado.
Identifiers: *Center pivot irrigation.

Design system capacities were developed for center pivot sprinklers irrigating corn in the Central Great Plains by simulating irrigations for 60 years of climatic data collected at Akron, Colorado. The system design provides three probability levels of net irrigation requirements versus optimum soil water depletion as affected by soils with various water holding capacities. The design system capacities developed from the simulation model allow for the depletion of available soil water. An empirical procedure for determining the net system capacity from ET(net) as affected by allowable depletion level is presented. (Skogerboe-Colorado State)
W75-11835

ANALYSIS OF CANAL SEEPAGE TO INTERCEPTOR DRAIN,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
H. D. Sharma, and A. S. Chawla.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 100, No IR3, p 351-369, September, 1974. 11 fig, 5 ref, 2 append.

Descriptors: *Canal seepage, Seepage, *Seepage control, Drainage effects, *Drainage practices, *Drains.

An analytical solution is obtained with the help of conformal mapping for the problem of steady seepage from a canal into an interceptor drain and to the main drainage lain in homogeneous and isotropic medium extending to infinite depth. Equations have been given to determine the seepage discharge into the drain and the coordinates of the phreatic surface. The solutions of the equations have been presented in the form of dimensionless curves to facilitate computations. The analysis indicates that discharge to the interceptor drain increases with an increase in the bed width of the channel and diameter of interceptor drain, whereas it decreases with an increase in distance between the canal and the interceptor drain. As the drain is brought closer to the canal, the rate of increase of seepage into the drain increases. The effect of the drain diameter in intercepting seepage discharge is more pronounced at a deeper setting of the drain. (Skogerboe-Colorado State)
W75-11846

8B. Hydraulics

SOLUTION OF A FREE-SURFACE BOUNDARY VALUE PROBLEM USING AN INVERSE FORMULATION AND THE FINITE ELEMENT METHOD,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W75-11447

TURBULENT ENTRAINMENT ACROSS STABLE DENSITY STEP STRUCTURES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W75-11451

CLOSURE CONDITIONS MOUTH OF THE RUSSIAN RIVER,
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 2L.
W75-11454

A GEOMORPHIC SHORELINE INVENTORY WITH MANAGEMENT CONSIDERATIONS FOR WHATCOM COUNTY, WASHINGTON,
Western Washington State Coll, Bellingham. Coastal Studies Group.
For primary bibliographic entry see Field 2L.
W75-11455

RESISTANCE TO FLOW IN ALLUVIAL CHANNELS,
East-Central State Soil and Water Resources (Nigeria).
For primary bibliographic entry see Field 2E.
W75-11459

WATER HAMMER IN COAXIAL PIPE SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Hydro-mechanik, Staunanlagen und Wasserversorgung.
W. Burmann.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY6, Proceedings Paper 11374, p 699-715, June 1975. 12 fig, 4 ref, 2 append.

Descriptors: *Water hammer, *Pipe flow, Pipelines, Pipes, Hydraulics, Tubes, Numerical analysis, Waves(Water).
Identifiers: *Coaxial pipe systems, *Wave equations, *Characteristic method, Wave dispersion, Wave propagation, Computation.

Transporting fluids involves the use of coaxial pipe systems in which water hammer may occur due to pump failure or valve operation. Investigations into the behavior of water hammer phenomena in such pipe systems of several different flow sections were reported. The solution of the differential equations covering nonstationary fluid flow in pipe systems of several different flow sections by means of the method of characteristics was sketched. The wave propagation as well as the transmission and reflection of waves at changes in diameter or density, and at pipe junctions, were expressed by the simplest possible formulas. (Lee-ISWS)
W75-11460

SUBMERGED BUOYANT JETS IN QUIESCENT FLUIDS,
Stone and Webster Engineering Corp., Boston. Mass. Environmental Engineering Div.
D. T. L. Chan, and J. F. Kennedy.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY6, Proceedings Paper 11383, p 723-747, June 1975. 6 fig, 25 ref. ONR Contract N00014-68-A-0196-0004.

Descriptors: *Buoyancy, *Temperature, Turbulence, Hydraulics, Diffusion, Entrainment, Diffusivity, Fluid mechanics, Jets, Flow, Thermal water, Discharge(Water), Numerical analysis.
Identifiers: *Jet flows, *Plumes, Diffusers, Quiescent fluids, Jet momentum, Buoyant jets.

An integral-type analysis was developed for submerged buoyant jets discharged horizontally into quiescent homogeneous fluids. Equations for conservation of volume flux, buoyancy flux, and kinematic conditions were combined with three self-similarity assumptions and one entrainment assumption. The entrainment velocity was assumed to consist of two components, one related to the initial jet momentum and the second to the buoyancy force, so that the entrainment coefficients obtained from studies of pure jets and pure plumes could be utilized. A closed-form solution was obtained which yielded polynomials describing the trajectories of both round and slot jets and linear and parabolic relations for the dilution for round and slot jets, respectively. These relations compared favorably with experimental and numerical results reported by other investigators. (Lee-ISWS)
W75-11461

BOUNDARY SHEAR IN CHANNEL WITH FLOOD PLAIN,
Halcron (William) and Patners, London (England).
R. C. Myers, and E. M. Elsawy.
Journal of the Hydraulics Division, Proceedings of American Soceity of Civil Engineers, Vol 101, No HY7, Proceedings Paper 11452, p 933-946, July 1975. 14 fig, 2 tab, 13 ref, 2 append.

Descriptors: *Earth-water interfaces, *Channel flow, *Flood plains, *Shear stress, Shear, Hydraulics, Momentum transfer, Channels, Boundaries(Surfaces), Cross-sections.
Identifiers: *Preston tube, *Boundary shear, Interaction, Complex cross sections.

Shear stress distributions were measured around the periphery of a channel of complex cross section using Preston tube. The complex section consisted of a deep channel and a flood plain. The measurements were carried out in the laboratory for flow in the full cross section and when the flow was confined to the deep section. In this way it was possible to compare shear stress distributions under both isolated and interacting conditions. It was revealed that the presence of the interactions between a channel and its flood plain significantly alters the values and distributions of boundary shear. The interaction mechanism increases average flood plain shear, falling off as depth increases, and has the effect of decreasing channel shear and altering the shear stress distribution shape. (Lardner-ISWS)
W75-11463

RIVER REGIME WITH SPECIAL REFERENCE TO RIVER NILE,
Assiut Univ. (Egypt). Dept. of Hydraulics.
For primary bibliographic entry see Field 2J.
W75-11464

HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
A. F. Babb.
Bulletin 326, 1972. 116 p, 13 fig, 11 tab, 5 ref, 5 plates, 4 append.

Descriptors: *Hydraulic models, *Hydraulic structures, *Washington, *Columbia River, Model studies, Spillways, Fish passages, Hydroelectric plants, Channels, Navigation, Dams, Intakes structures, Outlets, Discharge(Water, Currents(Water), Laboratory tests, Hydraulic similitude, Distribution patterns, Velocity, Water levels, Calibrations.
Identifiers: *Rock Island Hydroelectric Project(Wash).

A second powerhouse facility is proposed for the Rock Island Hydroelectric Power Project, located on the Columbia River near Wenatchee, Washington. The modified river flow patterns were studied with the use of a 1:75 scale model. Included were investigations of (1) the flood-passing capability of both the existing and proposed structures, (2) the establishment of the best orientation of the new powerhouse from the standpoint of maximizing power output, and (3) the creation of flow patterns that would be compatible with the passage of anadromous fish and possible future navigation. Test results were summarized for spillway capacity, powerhouse orientation, navigation, and fish facilities. Appendixes presented data for model verification, velocities and flow patterns for existing structures, velocities and flow patterns for powerhous orientation tests, and navigation approach channel velocities. (See also W75-11467) (Humphreys-ISWS)
W75-11466

HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT, COFFERDAM TESTS,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
A. F. Babb.
Bulletin 326, Supplement No 1, February 1974. 18 p, 8 fig, 3 tab, 1 plate, append.

Descriptors: *Hydraulic models, *Hydraulic structures, *Washington, *Columbia River, *Cofferdams, Model studies, Spillways, Fish passages, Hydroelectric plants, Discharge(Water), Current(Water), Velocity, Distribution patterns, Water levels, Navigation, Dams, Laboratory tests, Gates, Flow control, Operations.
Identifiers: *Rock Island Hydroelectric Project(Wash).

Detailed descriptions of the Rock Island Project, the hydraulic model, the model testing program, and model test results relating to hydraulic conditions after completion of the second powerhouse were given in Bulletin 326 (1972), which gave results of tests conducted on spillway capacity, powerhouse orientation, navigation, and fish passage. Supplementary report presented data that describes flow conditions during construction to assist in design of cofferdam. Two cofferdam arrangements were tested in the model. A gate-operation sequence that will produce flow patterns conducive to efficient passage of fish was tabulated. (See also W75-11466) (Humphreys-ISWS)
W75-11467

SCALE EFFECTS ON COOLING TOWER MODEL STUDIES,
Iowa Inst. of Hydraulic Research, Iowa City.
T. W. Bugler, III, and J. C. Tatinclaux.
IIHR Report No 168, September 1974. 95 p, 58 fig, 8 tab, 8 ref.

Descriptors: *Hydraulic models, *Cooling towers, *Jets, *Temperature, *Model studies, Laboratory tests, Dimensional analysis, Density, Froude number, Reynolds number, Turbulence, Entrainment, Flumes, Mechanical control, Discharge(Water), Heated water, Thermal pollution.
Identifiers: *Mechanical cooling towers, *Scale effects(Models), Heated discharge, Blockage.

Scale effects had been observed in model studies of mechanical draft cooling towers. Four models with scale ratios of 1/150 and 1/504 were tested in a flume. Scale and blockage effects were investigated by recording temperature distributions in the plume from the cooling tower model. Lateral blockage was found to be no problem. The limited vertical depth was a problem if the jet velocity was more than twice the ambient current velocity in the flume. Limiting scale, width, and depth ratios were determined. (Adams-ISWS)
W75-11470

PROGRESS REPORT TO THE ARKANSAS STATE HIGHWAY COMMISSION FOR YEAR ENDING JUNE 30, 1975,
Geological Survey, Little Rock, Ark.
M. S. Hines.
Open-file report, 1975. 21 p, 1 fig, 1 plate, 1 tab.

Descriptors: *Hydrologic data, *Flood frequency, *Peak discharge, *Bridge construction, *Arkansas, Open channel flow, Hydraulics, Flow characteristics, Flow around objects.
Identifiers: Progress report.

The economic design of bridges and culverts requires a knowledge of the magnitude and frequency of floods for all size drainage basins. The Arkansas State Highway Commission and the U.S. Geological Survey are cooperating in a program to provide information concerning flood frequency and open-channel hydraulics. A summary of the accomplishments of the program is presented. Included are plans for future work and a brief description of related water-resources programs of the Geological Survey in Arkansas. The primary objective is to define regional flood-frequency relations for Arkansas, with particular emphasis placed on drainage areas of less than 50 square miles. The secondary objective is to analyze the hydrologic and hydraulic floodflow characteristics at specific bridge sites. In addition, the program includes the documentation of unusual small-area floods. The network of 106 crest-stage stations was operated to determine the annual peak stage and discharge at all sites. (Woodard-USGS)
W75-11501

PREDICTIVE MODELING OF EFFECTS OF THE PLANNED KINDRED LAKE ON GROUND-WATER LEVELS AND DISCHARGE, SOUTHEASTERN NORTH DAKOTA,
Geological Survey, Bismarck, N.Dak.
For primary bibliographic entry see Field 4A.
W75-11503

HYDRAULIC DESIGN OF VERTICAL STILLING WELLS,
Bureau of Reclamation, Denver, Colo. Div. of Research.
P. H. Burgi.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11451, p 801-816, July 1975. 12 fig, 2 tab, 7 ref, 2 append.

Descriptors: *Energy loss, *Design criteria, *Hydraulic models, *Cavitation, Hydraulics, Hydraulic structures, Dimensional analysis.
Identifiers: *Vertical stilling wells, *Sleeve valves, Corner fillet, Corner angle.

Vertical stillings wells are economical and ideally suited to dissipate high energy flow. Model studies established general design criteria for vertical stilling wells using a standard sleeve valve. Dimensionless parameters based on design discharge Q and valve diameter D were established to aid the designer in determining optimum well size for a specific need. Over 100 tests were conducted with two laboratory models to determine stilling well geometry. Corner fillet and corner angle proved the best design configurations. A graphical method of presentation was included to aid the designer in sizing the vertical stilling well, and design example demonstrating the method was presented. (Lardner-ISWS)
W75-11650

TURBULENT FLOW OF POWER-LAW FLUIDS,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
A. I. Y. Mohammed, N. N. Gunaji, and P. R. Smith.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No

HY7, Paper 11459, p 885-900, July 1975. 8 fig, 2 tab, 16 ref, 2 append.

Descriptors: *Conduits, *Turbulence, *Turbulent flow, Fluid mechanics, Hydraulics, Friction, Momentum transfer, Non-Newtonian flow, Pipe flow.
Identifiers: *Power-law fluids, *Reynolds stress, Mixing length, Fanning friction factor.

Velocity profiles for the steady incompressible turbulent flow of power-law fluids through circular conduits were calculated by numerical quadrature considering both the viscous stresses and the Reynolds stresses operative over the entire cross section of the flow. A non-Newtonian stress coefficient, K sub n, was introduced along with mixing length, l, so that the Reynolds stresses could be put in a form similar to that of the viscous stresses. The form of the Reynolds stresses thus obtained reduced to the Newtonian form when the flow behavior index, n, equaled unity. Both l and K sub n were assumed dependent upon the Reynolds number. Similarly, friction factors for the turbulent flow of power-law fluids were calculated by numerical quadrature. The calculated friction factors were compared to 146 measured friction factors over a range of Reynolds numbers from 2670 to 108,800. The mean absolute difference between calculated and measured friction factors for this sample was 3% with a standard deviation of 1.9%. (Lee-ISWS)
W75-11651

SOLID PARTICLE SETTLEMENT IN OPEN-CHANNEL FLOW,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-11652

WALL SHEAR MEASUREMENT IN SAND-WATER MIXTURE FLOWS,
Middle East Technical Univ., Ankara (Turkey). Dept. of Civil Engineering.
O. Yucel, and W. H. Graf.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11453, p 947-963, July 1975. 9 fig, 13 ref, 2 append.

Descriptors: *Boundary layers, *Anemometers, *Turbulence, Hydraulics, Measurement, Heat transfer, Reynolds number, Dimensional analysis, Hydrodynamics, Instrumentation, Fluid mechanics.
Identifiers: *Boundary shear, Two phase flow, Wall shear stress, Skin friction, Sand-water mixture flow.

The wall shear stress was measured in clear-water and sand-water mixture flows with the use of a flush-mounting hot-film shear-sensor. Data were obtained with two shear-sensors and two different sands (d50 = 0.45 mm and d50 = 0.88 mm) with solids concentrations of up to maximum C = 1.6% by volume, and for flow Reynolds numbers of 100,000 less than RD less 600,000. The 'measured' sensor wall shear stresses were compared with the 'true' wall shear stresses obtained with the energy head loss measurements conducted in a pipeline system. The results of the tests in the clear-water flows confirmed the relationship between the sensor power output, P sub S, and the cubic root of the wall shear stress having linear relationship. The tests with the low-concentration sand-water mixtures in a vertical pipe indicated that, for the present range of experiments, sensor power outputs with the mixtures exceeded those for clear-water by an average of 5%. It is shown that the shear-sensors are delicate but accurate instruments that can be used for the measurement of the wall shear stress. (Lee-ISWS)
W75-11653

TURBULENT DRAG COEFFICIENTS OF SHARP-EDGED OBJECTS,
Ecole Polytechnique Federale de Lausanne (Switzerland). Laboratoire d'Hydraulique.
W. H. Graf, and F. F. Mansour.
Journal of Hydraulic Research, Vol 13, No 2, p 127-147, 1975. 10 fig, 14 ref.

Descriptors: *Turbulence, *Drag, Dimensional analysis, Fluid mechanics, Reynolds number, Hydrodynamics, Turbulent flow.
Identifiers: *Turbulence intensity, *Drag coefficients, *Turbulence scale, Empirical relations, Bluff bodies, Cubes, Square rods, Circular cylinders.

The drag coefficient in turbulent flow has been found to be a function of the turbulence intensity, a dimensionless turbulence scale, and the Reynolds number. Ko and Graf combined these three factors into a single term called the 'turbulence characteristics' for circular cylinders. The correlation was extended here to sharp-edged objects, such as cubes and square rods. The ratio of the turbulence intensity squared to the drag coefficient was found to yield a better correlation with the turbulence characteristics parameter than the drag coefficient. The plots of published data for cubes and square rods showed trends similar to the plot for the circular cylinder. (Adams-ISWS)
W75-11654

ANALYSIS OF PLUNGING PHENOMENA IN WATER RESERVOIRS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 4A.
W75-11655

VELOCITIES ABOVE ROUGH BED IN OSCILLATORY FLOW,
Cambridge Univ. (England). Dept. of Engineering.
J. F. A. Sleath.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 100, No WW4, Proceedings paper No 10930, p 287-304, November 1974. 18 fig, 13 ref.

Descriptors: *Coastal engineering, *Flow, *Stability, *Turbulence, *Velocity, *Waves(Water), Hydrodynamics, Oceanography, Reynolds number, Numerical analysis, Analytical techniques, Laminar flow, Measurement, Roughness(Hydraulics), Equations.
Identifiers: *Fluid flow, Finite difference approximation, Rough beds.

Presented are the results of analytical and numerical solutions for the velocities produced by progressive water waves in the boundary layer above a two-dimensional rough bed. The fluid velocities close to the two-dimensional rough bed were calculated for laminar oscillatory flow, similar to that produced by waves near the seabed. At low Reynolds numbers a small-perturbation procedure was used and at high Reynolds numbers the equations of motion were solved numerically, using a finite-difference approximation. The numerical solution indicates that the flow remains laminar up to much higher Reynolds numbers than has previously been supposed, and this conclusion is confirmed by hot-wire anenometer measurements. Comparison of the computed velocity profile with measurements by Kalkanis suggests that the mean velocities may still be well represented by the numerical solution even when the flow does become turbulent. The solution involves no experimentally-determined constants and applies to situations of practical importance, and also to flow over flat beds of sand provided an appropriate definition of roughness length is used. (Bell-Cornell)
W75-11763

INFLUENCE OF CURRENT ON STATISTICAL PROPERTIES OF WAVES,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-11772

EXPERIMENTAL STUDY OF WAVE TRANSIMISSION,
Sir George Williams Univ., Montreal (Quebec). Dept. of Civil Engineering.
M. S. Nasser, and J. A. McCorquodale.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 100, No WW4, Proceedings paper No 10928, p 279-286, November 1974. 5 fig, 1 tab, 7 ref.

Descriptors: *Coastal engineering, *Gabions, *Rock fill, *Waves(Water), Structures, Embankments, Porous media, Shallow water, Analytical techniques, Unsteady flow, Water levels, Hydraulics, Equations, Mathematical models, Systems analysis.
Identifiers: *Wave propagation, *Wave runup, Nonlinear systems, Reflection, Wave steepness, Transmission data, Impervious cores, Multilinear regression, Experiments, Non-Darcy flow.

Unsteady non-Darcy flow in rectangular rock-fill embankments with impervious cores was studied experimentally by subjecting the embankments to nonlinear, shallow water waves. Crushed rock and quartz were utilized, in sizes ranging from 0.7 cm to 4.4 cm, to build embankments of various widths. The waves in all experiments were nonbreaking. The embankments were tested for several wave conditions. Empirical formulas are presented for transmission, reflection, runup, and rushdown, and all give good correlations. An upward shift of the mean water level in the embankments was detected during the experiments. It was found that transmission decreased with decreasing conductivity and increasing wave steepness and embankment width, and that reflection decreased with increasing conductivity and width of embankment. (Bell-Cornell)
W75-11773

WAVE ENERGY TRANSFER MECHANISMS IN WIND-WAVE TUNNELS,
Amoco Production Co., Tulsa, Okla.
J. B. Bole.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 100, No WW4, Proceedings paper No 10932, p 325-344, November 1974. 8 fig, 5 tab, 22 ref.

Descriptors: *Air-water interfaces, *Waves(Water), *Dispersion, *Energy transfer, *Coastal engineering, Height, Deep water, Shear stress, Measurement, Equations, Mathematical models, Gravity waves.
Identifiers: *Wind-wave tunnels, Ocean engineering, Normal stress, Experiments, Graphs.

Theoretical and experimental results are reviewed for five exponential mechanisms that operate on small-amplitude deepwater gravity waves in wind-wave tunnels. Energy source term mechanisms are those due to: (1) tangential shear stress; (2) phase-shifted normal stress; and (3) airflow-pressure-gradient normal stress. Energy sink term mechanisms include only those due to viscous dissipation in the far field, and in the wall boundary layers. The results of experiments by Liang are shown to compare favorably with the theoretical airflow-pressure-gradient normal stress and to confirm its importance. On the basis of this result, phase-shifted normal stress is recalculated for the laboratory wave growth data of Bole and Hsu and is found to be an average of only 1.7 times the theoretical results of the Miles inviscid shear-flow model. This finding is in substantial agreement with the recent field measurements of Elliot, but it

is in disagreement with earlier field investigations. Graphs are presented to illustrate the relative importance of the five energy transfer mechanisms for laboratory experimental conditions. (Bell-Cornell)
W75-11774

CAVITATION IN BUTTERFLY VALVES,
Colorado State Univ., Fort Collins.
J. W. Ball, and J. P. Tullis.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY9, Proceedings paper No 9993, p 1303-1318, September 1973. 12 fig, 2 tab, 15 ref.

Descriptors: *Butterfly valves, *Cavitation, *Flow control, *Hydraulics, *Pipe flow, Pipelines, Data collections, Water conveyance, Pressure, Size, Design criteria, Equations, Evaluation.

Tests made at Colorado State University have resulted in a generalization of cavitation data, making them useful in developing pipeline designs utilizing butterfly valves as control. Related cavitation design criteria evolved from the tests and the cavitation parameters considered in developing designs for water systems in which butterfly valves are used are presented. Methods for defining capacity and specific degrees of cavitation intensity (incipient, critical, and choking or supercavitation) and for evaluating cavitation design limits are given. The importance of scale effects related to system pressure and size of valve is stressed and procedures for adjusting for these scale effects are outlined. The cavitation characteristics of butterfly valves have been generalized and an example of the application of these data to the design of water conveyance systems is offered. The performance characteristics of valves makes the upstream end or the low point in the pipeline the optimum location when it is desired to minimize noise and damage due to cavitation (free discharge not considered). The design example given considers this performance characteristic. (Bell-Cornell)
W75-11777

ENERGY LOSSES AT 90 DEGREES PIPE JUNCTIONS,
Tohoku Univ., Sendai (Japan). Inst. of High Speed Mechanics.
H. Ito, and K. Imai.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY9, Proceedings paper No 10022, p 1353-1368, September 1973. 12 fig, 3 tab, 23 ref.

Descriptors: *Pipe flow, *Hydraulics, *Head loss, *Junctions, Energy loss, Flow resistance, Water distribution(Applied), Diameter, Design, Reynolds number, Equations.
Identifiers: *Tees, Formulas.

The problem of determining the energy loss caused by the combination and division of flow at pipe junctions has been considered. The loss coefficients and the power-loss coefficients for four smooth tees with diameter ratio of unity were determined experimentally for each of all configurations of flow through tees. Through-out the test, the Reynolds number before the division or after the combination of flow was within the range of 10 to the 5th power - 2x10 to the 5th power. The radius of curvature of the wall at the joining edge ranged from zero up to half the diameter of the straight pipe. Empirical formulas for loss coefficients and those for power-loss coefficients which are in good agreement with experiments were presented for each configuration of flow. Empirical formulas for loss coefficients for dead end tees were also given. The comparison of the proposed formulas with the experimental results of previous investigators showed that the proposed formulas can be used to reliably estimate the energy losses at tees. (Bell-Cornell)
W75-11778

OCEAN ENGINEERING--SELECTED REFERENCES,
American Society of Civil Engineers, New York. Task Committee on Selected References of the Technical Council on Ocean Engineering.
W. J. Tudor.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 100, No WW3, Proceedings paper No 10767, p 241-248, August 1974. 96 ref.

Descriptors: *Coastal engineering, *Bibliographies, *Information retrieval, *Ocean waves, Anchors, Ocean currents, Underwater, Construction.
Identifiers: *Ocean engineering, Moorings, Ocean bottom.

This bibliography has been prepared by the committee on Selected References in Ocean Engineering of the Technical Council on Ocean Engineering. The references were chosen as being practical and useful to those involved in ocean engineering. Twelve catagories were used: site selection and environmental parameters (hydrospace or seafloor and coastline); soil properties, foundations and site preparation; construction equipment and systems; anchorage and moorings; design criteria and materials; life support and human engineering; management; legal; deep ocean simulation; recreation, energy, pollution, etc..; indices; and trade magazines and journals. (Bell-Cornell)
W75-11779

FRICTION--FREQUENCY DEPENDENCE FOR OSCILLATORY FLOWS IN CIRCULAR PIPE,
Technische Hogeschool, Delft (Netherlands). Lab. of Thermal and Nuclear Engineering.
H. H. Safwat, and J. v. d. Polder.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY11, Proceedings paper No 10158, p 1933-1945, November 1973. 12 fig, 6 ref.

Descriptors: *Hydraulics, *Flow, *Fluid friction, Hydrodynamics, Pipe flow, Shear stress, Unsteady flow, Frequency, Mathematical models, Forecasting.
Identifiers: *Friction coefficient(Hydraulic).

Measured data of velocity changes in oscillatory flow (o.16Hz-0.36Hz) are presented. The actual wall shear stresses obtained from these measurements are compared to calculated values based on steady flow relations and Zielke's model. A new model for the prediction of the wall shear stress as a function of velocity and acceleration changes is introduced. The proposed model may be a suitable basis for the prediction of friction data for one-dimensional flow analysis under nonsteady conditions. (Bell-Cornell)
W75-11780

SIMULATION OF DISPERSION OF SUSPENDED PARTICLES,
Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
B. M. Sumer.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY10, Proceedings paper No 10056, p 1705-1726, October 1973. 8 fig, 2 tab, 17 ref, 3 append.

Descriptors: *Open channel flow, *Sediment transport, *Simulation analysis, *Numerical analysis, *Dispersion, *Hydraulics, *Uniform flow, Turbulent flow, Diffusion, Shear, Flow, Suspended load, Equations, Mathematical models, Systems analysis, Velocity, Digital computers.
Identifiers: Lagrangian functions.

Using the Lagrangian approach, the dispersion of suspended particles in turbulent open-channel flow is numerically simulated using a digital computer. Statistical properties which include the mean and variance of the distribution and probability density function of particle coordinates are computed for a certain range of the settling velocity parameter. The boundary condition at the bottom is assumed so that there is no particle entrainment in the flow from the bottom and no particle deposition on the bottom, i.e., particles remain in suspension motion all the time. The path of an initially marked particle is followed as it goes through statistical field variables. Many such paths are used to compile the probability distribution by an ensemble average. Two types of results are obtained: (1) the mean and variance of particle displacement in the flow direction; and (2) the probability density function of particle coordinates. Simulation results are compared, quantitatively, with presently available information. Assuming that the rms of the particle (heavy) fluctuating velocity and the Lagrangian time scale for heavy particles are equal to those for fluid particles causes an error in the horizontal component of particle step which is greater than that in the vertical component; moreover, it appears that the mean computed by the simulation is reasonably satisfactory whereas the variance is not. The numerical simulation technique presented provides simplicity, flexibility and saving in computer time; its disadvantages include its relatively approximate nature and its requirement of correct input information. (Bell-Cornell)
W75-11782

ENGINEERING ASPECTS OF WATER HARVESTING RESEARCH AT THE UNIVERSITY OF ARIZONA,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W75-11802

8C. Hydraulic Machinery

VALVE FOR CONTROLLING LIQUID DISCHARGE.
Netherlands Patent 81931V/47. Issued November 6, 1974. Derwent Netherlands Patents Report, Vol 47, No 5, p 2, November 11, 1974.

Descriptors: *Patents, *Valves, Liquids, Waste disposal, Plastics, Construction materials, Sewage disposal.
Identifiers: Polyvinylchloride(PVC), Waste discharge, Hinges.

A patent was granted for a valve for controlling liquid discharge, with a plastic frame defining an opening, a plastic flap, and a hinge. This tide valve is to be placed on the banks of waters with a varying liquid height, and is especially useful for discharging sewage into tidal waters. It has a plastic frame, made of a substance such as polyvinylchloride, defining an opening and a plastic flap, such as of asbestos-reinforced PVC, hinged for closing the opening. The flap is placed in the open end of a tube piece, with the flexible plastic hinge fastened to the frame and the flap, and is protected against damage. The hinge is thus given good protection and ensures prolonged and reliable operation. (Prague-FIRL)
W75-11417

WATER HAMMER IN COAXIAL PIPE SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Hydro-mechanik, Staunanlagen und Wasserversorgung.
For primary bibliographic entry see Field 8B.
W75-11460

SUBMERGED BUOYANT JETS IN QUIESCENT FLUIDS,
Stone and Webster Engineering Corp., Boston. Mass. Environmental Engineering Div.

For primary bibliographic entry see Field 8B.
W75-11461

APPARATUS FOR SEWER TREATMENT TO KILL THREE ROOTS AND OTHER ORGANIC GROWTH THEREWITHIN,
Airrigation Engineering Co., Inc. Carmel Valley, Calif. (assignee).
For primary bibliographic entry see Field 5G.
W75-11513

MILE OF SEWER LINE RENEWED WITH PLASTIC PIPING.
For primary bibliographic entry see Field 5D.
W75-11619

PIPE INSERTION RENEWS SEWERS WITH LITTLE EXCAVATION.
For primary bibliographic entry see Field 5D.
W75-11620

DOMESTIC WASTE WATER AND SEWAGE EVACUATION DEVICE.
For primary bibliographic entry see Field 5D.
W75-11661

SEWER BRANCH SADDLE CONNECTOR,
J. H. Clark, C. D. Burrier, and L. W. Gove, Jr.
Canadian Patent 970,792. Issued July 8, 1975. Patnet Office Record, Vol 103, No 27, p 63, July, 1975.

Descriptors: *Patents, *Sewers, *Sewerage, *Pipelines, Equipment, Waste water treatment.
Identifiers: *Sewer connections, Sewer branch saddle connector.

A patent was issued for a connector used for the connection of a lateral or branch sewer pipe line into a main sanitary sewer pipe line at a point where there is no T or Y connector available. Called a saddle connector, the assembly consists of a cast iron saddle which will fit over a tapped hole in the main sewer pipe line. The saddle has a 360 degree circular rubber O-shaped ring sealing gasket, cemented in its retaining groove, which is located on the saddle underside. The saddle is secured to the main sewer pipe line with a stainless steel strap and bronze T bolts, using attaching washers and nuts. (Kramer-FIRL)
W75-11677

SEWER LINE BLOW-OUT PLUG,
M.M.S., Inc., Memphis, Tenn. (assignee).
M. R. Melton.
United States Patent 3,895,466. Issued July 22, 1975. Official Gazette of the United States Patent Office, Vol 936, No 4, p 1199, July, 1975. 1 fig.

Descriptors: *Patents, *Pipelines, *Pipes, *Sewerage, Equipment, Pressure, Hydraulics, Waste water treatment.
Identifiers: Sewer line blow-out plug.

A patented plug for sewer lines is described. This plug assembly is adaptable and will seal a clean-out end of a pipe or pipe system under normal pressure conditions. However, when subjected to slight over-pressure within the pipe system, the plug will blow out, thus releasing this pressure. The assembly system consists of first and second plates for reception within the open end of a clean-out pipe and a jell-like material sandwiched between the two plates which is extrudable to engage the inferior surface of the pipe and to hold the plug within the pipe under normal conditions. (Kramer-FIRL)
W75-11684

CENTRIFUGES - TYPES AND APPLICATIONS,
Penwalt Corp., Warminster, Pa. Sharples-Stokes Div.

For primary bibliographic entry see Field 5D.
W75-11725

DIMENSIONING AND DESIGN OF SMALL WASTE WATER PUMPING STATIONS (BEMESSUNG UND GESTALTUNG VON KLEIN-ABWASSERPUMPWERKEN),
F. Siefert.
Technische Mitteilungen, Vol 68, No 5, p 167-172, May, 1975. 6 fig.

Descriptors: *Pumping plants, *Design, *Pumps, Construction costs, Flood protection, Pipes.
Identifiers: Small-capacity pumping stations.

General problems of the dimensioning and design of small waste water pumping stations are described. Dry type pumps offer advantages over wet type pumps in that they facilitate cleaning due to a separated suction space. Wet type pumps require lower construction costs and less strict flood protection. Vertical pumps offer increased flood protection, while horizontal layout permits adjustment of the pump capacity to particular flow conditions. Suction and delivery pipes should have a minimum diameter of 100 mm. Delivery pipes should be made of corrosion-resistant steel with a minimum wall thickness of 6 mm. The suction space should be tiled or lined with fiber-glass-reinforced polyester to facilitate scavenging. (Takacs-FIRL)
W75-11744

DESIGN CRITERIA FOR SINGLE-POINT MOORING TERMINALS,
Shell Internationale Research Maatschappij N.V., The Hague (Netherlands).
J. M. Langeveld.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Socity of Civil Engineers, Vol 100, No WW4, Proceedings paper No. 10931, p 305-323, November 1974. 9 fig, 6 ref.

Descriptors: *Harbors, *Hydrography, Environmental engineering, Buoys, Deep water, Safety, *Design criteria, Operations and maintenance, Computer models, Computer programs, Alternative planning, Sites, Coastal engineering, Operations research.
Identifiers: *Crude oil, *Offshore structures, Terminal facilities, Marine environment, Tanker ships, Moorings, Berths.

Single-point moorings have come to be accepted as a logical choice for off-shore berths for large tankers. The type most commonly used is that in which a single-mooring buoy (SBM) is anchored to the seabed with long catenaries of chain. Site selection for single-point moorings (SPM) is governed above all by safety of operation of the tanker in maneuvering and mooring. Site conditions and marine environment play a major part in judging this safety. Detailed information is required on bottom conditions, sea levels, currents, winds, waves, and visibility. In the design of a specific single-buoy mooring system, the main parameter is the mooring load. Determination of this load requires model tests, since reliable design formulas are not yet available. The Royal Dutch/Shell Group, in their world-wide operations, are successfully using their single-buoy mooring system, which is undergoing gradual improvements. SBM can be operated without causing pollution to the surrounding coastline and without detrimental effect on the local marine environment. (Bell-Cornell)
W75-11771

CAVITATION IN BUTTERFLY VALVES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 8B.
W75-11777

8D. Soil Mechanics

DETERMINING EFFECTIVE SOIL WATER DIFFUSIVITIES FROM ONE-STEP OUTFLOW EXPERIMENTS,
Minnesota Univ., St. Paul.
For primary bibliographic entry see Field 2G.
W75-11592

EXPERIMENTAL STUDY OF WAVE TRANSIMISSION,
Sir George Williams Univ., Montreal (Quebec). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-11773

EFFECT OF BACKFILL ON DRAIN FLOW IN LAYERED SOILS,
California Univ., Davis.
R. B. Hwang, J. N. Luthin, and G. S. Taylor.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 100, No IR3, p 267-276, September, 1974. 4 fig, 1 tab, 10 ref.

Descriptors: *Drainage practices, Drainage engineering, *Drains, *Soil profiles, Soil properties, Hydraulic conductivity, *Backfill, Compaction, *Compacted soils.

The purpose of the work is to shed some light on the transient flow towards drains in layered soils with the ultimate goal of improving the techniques of drainage design. The combination of layers occurring in the field soils is very great but experience shows that many soils can be treated as two-layered soils from a standpoint of drainage design. Trial-and-error methods in the field may well be the best way to treat some of the more complicated soil layering problems. However, for soils that can be approximated by a two-layer model the results presented herein will improve our understanding of the flow towards drains and the effect of the backfill material on such flow. (Skogerboe-Colorado State)
W75-11834

8G. Materials

GYPSUM SOLUBILITY AND SCALING LIMITS IN SALINE WATERS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 3A.
W75-11473

8I. Fisheries Engineering

HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
For primary bibliographic entry see Field 8B.
W75-11466

HYDRAULIC MODEL STUDIES OF A SECOND POWERHOUSE AT ROCK ISLAND HYDROELECTRIC PROJECT, COFFERDAM TESTS,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
For primary bibliographic entry see Field 8B.
W75-11467

EFFECTS OF FISH-PONDS NEAR JAKUBOVO ON THE ORNITHOCENOSE THERE, (IN CZECH),
Komenskeho Universita, Bratislava (Czechoslovakia). Katedra Syst. Ekol. Zool.

For primary bibliographic entry see Field 5C.
W75-11535

BIOLOGICAL CONSIDERATIONS ON THE USE OF THERMAL EFFLUENTS FOR FINFISH AQUACULTURE,
Oceanic Inst., Waimanalo, Hawaii.
For primary bibliographic entry see Field 5C.
W75-11759

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

DIRECTORY OF WATER RESOURCES EXPERTISE, WATER RESEARCH FACULTY AND STAFF SCIENTISTS.
California Univ., Davis. Water Resources Center.
For primary bibliographic entry see Field 10C.
W75-11580

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

PLATING AND CYANIDE WASTES, (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W75-11370

COASTAL ZONE LEGAL REFERENCES (SELECTED) 1975.
State Univ. of New York, Buffalo. Faculty of Law and Jurisprudence.
For primary bibliographic entry see Field 2L.
W75-11548

A BIBLIOGRAPHY OF BISCAYNE BAY, FLORIDA MONITORING AND RESEARCH PROGRAMS,
Miami Univ., Fla. Sea Grant Institutional Program.
P. C. Rosendahl.
Special Report Number 2, May 1975. 82 p, 11 fig.
OSG 04-5-158-14.

Descriptors: *Data collections, Documentation, *Natural resources, Water resources, Ecosystems, Ecology, Investigations, Baseline studies, *Florida, *Bibliographies.
Identifiers: *Data monitoring programs, *Marine ecosystems, Data bases, Chemical data, Physical data, Biological data, *Biscayne Bay(FL).

Biscayne Bay is a natural resource of paramount importance to the citizens of Dade County and all of Florida. To determine the changes that have occurred to this marine ecosystem in recent time and to monitor future changes, a number of data collection programs have been conducted. This report attempts to identify data monitoring programs that have been conducted in the bay. To be included in this report, a program had to cover a broad geographical area or a time period of at least a year. Data bases should ideally have time spans of five years or more, but such a requirement would have reduced the list almost to zero. This report includes any study covering at least a Card Sound-size area of the bay, even the one-time studies. Part II also contains a literature survey for Biscayne Bay of about 900 citations. This survey should not be considered exhaustive, but should be revised as new references are discovered or new reports are written. (NOAA)
W75-11557

DIRECTORY OF WATER RESOURCES EXPERTISE, WATER RESEARCH FACULTY AND STAFF SCIENTISTS.
California Univ., Davis. Water Resources Center.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 278, $4.75 in paper copy, $2.25 in microfiche. Miscellaneous Report, Revised August 1975, 85 p.
OWRT A-999-CAL(10).

Descriptors: *Scientific personnel, *Research and development, Universities, Publications, *California.
Identifiers: Directories.

The objective is to identify as nearly as possible those faculty and staff scientists in the University of California actively investigating one or more aspects of water resources problems. The Directory may be used as a means of direct contact with the investigator or as a means of identifying those who have published results of research investigations. The Water Resources Center maintains two specialized collections of published and archival research reports in which are located many of the publications and studies of scientists listed in the Directory. The primary collection is on the Berkeley Campus and the smaller, more regionally-oriented collection, is on the Los Angeles Campus. (Snyder-California, Davis)
W75-11580

OCEAN ENGINEERING--SELECTED REFERENCES,
American Society of Civil Engineers, New York. Task Committee on Selected References of the Technical Council on Ocean Engineering.
For primary bibliographic entry see Field 08B.
W75-11779

10F. Preparation Of Reviews

PLATING AND CYANIDE WASTES, (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 05D.
W75-11370

SEDIMENT TRANSPORT THEORIES: A REVIEW,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 02J.
W75-11453

QUANTITATIVE INORGANIC ANALYSIS BY GAS CHROMATROGRAPHY, A REVIEW,
Birmingham Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W75-11528

PLATING AND CYANIDE WASTES (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 05D.
W75-11545

URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
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CONTINUOUS MONITORING, AUTOMATED ANALYSIS AND SAMPLING PROCEDURES, (LITERATURE REVIEW),
Florida Univ., Gainesville.
For primary bibliographic entry see Field 05A.
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SLUDGE HANDLING AND DISPOSAL SEMINAR, CONFERENCE PROCEEDINGS NO. 2.
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
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B. STATE WATER RESOURCES RESEARCH INSTITUTES	W75-11351--11357 11477--11478 11580, 11783	11
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

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